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TUBERCULOSIS IN INDIA

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TUBERCULOSIS IN INDIA

Its Prevalence, Causation and Prevention

BY

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To My Wife.

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PREFACE.

Considering the wide prevalence of tuberculosis throughout the East Indian Empire, and the recognition of that prevalence both by the medical profession and by the people themselves, it is somewhat surprising that India has hitherto received so little attention from writers on the disease. The literature regarding tuberculosis in India is limited to isolated articles in medical journals, together with a few small pamphlets dealing with special aspects of the subject. No apology is needed therefore, for an attempt to present in a somewhat more comprehensive form information which is now available, especially since in certain particulars the results of Indian experience would appear to shed valuable light upon the problem as it exists elsewhere.

As an instance of this may be mentioned the important question of the causative connection between surgical tuberculosis and the bovine disease. Some authorities whose writings are widely read both in England and in India, continue to express the opinion that surgical tuberculosis is always of bovine origin. In the following pages I have tried to shew that surgical tuberculosis is prevalent over large areas in India where the possibility of infection from bovine sources may be practically or even absolutely excluded. If this be true, the fact is at least worthy of consideration by those in the United Kingdom or America who would connect all surgical tuberculosis with the use of tubercle-infected milk, while the recognition of the same fact in India is of obvious importance in regard to the question as to what may be the most fruitful lines of preventive effort.

One criticism of the book which will almost certainly be made, is that it is too popular for medical readers, yet too technical for the laity. In reply, I have to confess that the attempt to reach both classes of

readers simultaneously was made of set purpose. In regard to such a disease as tuberculosis, it seems to be of great importance that medical men should be fully acquainted with the close connection which it has with social problems, while on the other hand, in addressing non-medical readers, I was anxious that it should be clearly realized that statements made were not mere theories propounded for popular consumption, but actual matters of fact which could challenge contradiction by scientific observers.

A word of explanation may be offered with regard to two obvious imperfections in the book. The first of these is its poverty in detailed statistical information; the second, the fact that many of the returns that have been given are by no means recent, some of them dating even from before the war. The first defect is due to the unsatisfactory condition of the present machinery for the reporting and registration of vital statistics; one purpose of the book indeed will be served in drawing attention to what is lacking in this respect so far as the one disease is concerned.

As regards the date of some of the returns given, and of certain local reports quoted, it may be mentioned that during the years 1912—14, there was—owing largely to the influence of that great Director-General of the Indian Medical Service, the late Sir Pardey Lukis—a very marked degree of interest taken in the subject of tuberculosis throughout India. As a result of special inquiries at various centres made during those years, local returns and information were obtained which have not again become available. In cases where there was no reason to suppose that any marked change had occurred, it seemed well to give figures dating from this period, rather than to give no information at all.

I have heard quite recently of the establishment in England of a "People's League of Health." No details of this organization have as yet reached me, but its objects would seem to be somewhat similar to those mentioned in connection with the suggested "League of Health" for India. These two schemes have been wholly independent of each other in their inception, both as to title and aims, but it is somewhat significant that

even in England, the need for an organisation for diffusing health knowledge on a wide and popular scale, is now at last being recognised.

It is my earnest hope that this first attempt, however imperfect it may be, to deal with the problem of tuberculosis in India, may serve to stimulate inquiry regarding what is one of the great scourges of the country, and may thus lead to that spread of knowledge which is the essential preliminary to successful preventive effort.

I cannot conclude without expressing my grateful appreciation of the unfailing courtesy and helpfulness of my publishers, Messrs. Butterworth and Co. (India), especially mentioning the late Mr. H. M. Rogers of that firm, whose sudden death took place while the sheets were passing through the press.

9, Waudby Road,
Bombay.

A. L.

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TUBERCULOSIS IN INDIA.

INTRODUCTION.

The subject of tuberculosis is one which has attracted a considerable and increasing amount of attention in India during recent years. The interest which has been taken in the disease in Europe and America, the immense volume of literature which has been produced regarding it, and the extensive efforts made for limiting its spread, have naturally had their effect in this country, while its actual prevalence in the large cities, now that its causes and dangers are better understood, has aroused a deep interest in the minds of thinking men. There are many facts in the distribution and causation of tuberculosis in India which are of great importance when taken in conjunction with parallel facts observed in other countries; and on the other hand much of the experience gained elsewhere has been lacking in practical value for India, because it has not been brought into relation with Indian conditions of climate and social life.

There is one reason why this particular disease calls for the earnest consideration of all educated men and leaders of public opinion. The incidence of tuberculosis is one of the surest indications which nature gives, to those who have eyes to see, of widespread outrage against her laws of health. When a race or a community in its progress towards what is regarded as a higher civilisation, or in its quest after comfort or luxury or wealth, advances with too great rapidity in any special direction, or makes changes in habits of life without balancing those changes with the necessary safeguards.

there will inevitably be a price to pay, and there is no more accurate measure of this price than is afforded by the death-rate from consumption in its various forms. In the following pages I shall attempt to give illustrations of the truth of this thesis as applied to India, and at the same time, to show how the indication may be utilised not only to lessen what is now regarded with alarm as one of the severest scourges of the country, but also to correct some of the social errors of which it would seem to be the outcome. Opinions will differ widely as to the possibility or advisability of attempting to modify long-established social observances or habits, but it is surely well that thinking men should provide themselves with all the possible data which may enable them to estimate the cost in life and suffering which the continuance of such habits involves.

The material here presented represents the results of an inquiry into the causes, prevalence, and possible measures for prevention of tuberculosis in India, undertaken under the auspices of the Research Fund Association of the Indian Government. The Association, however, is in no sense responsible for the opinions advanced in this book, which represent throughout my own individual conclusions.

The need of an investigation into some of the problems connected with tuberculosis in India had been felt at the discussion on the subject at the second All-India Sanitary Conference, held in Madras in 1912, and was expressed in one of the resolutions:—

"That statistics appear to show that this disease is rapidly increasing in India, especially in urban areas, but that it is doubtful whether the increase is real or apparent only and due to such causes as more accurate diagnosis and registration. In view of the importance of this question a full and thorough inquiry seems desirable....."

Nothing however was done to give effect to this resolution, and at the fuller discussion which took place at the Lucknow Sanitary Conference in 1914, it was apparent that there were many matters, apart from the mere question as to whether tuberculosis was or was not on the increase in India, upon which further information was desirable, before preventive efforts on any wide scale

could be wisely initiated. The resolution on the subject passed at Lucknow commenced as follows:—

"(7) That the present prevalence of tuberculosis is such as to demand serious attention and special methods for dealing with it. That officers should be placed on special duty to study in detail the different problems affecting tuberculosis in India; to investigate the causes underlying it, and to organise efforts towards the diffusion of information on the subject, and measures for the prevention of infection."

The above mentioned inquiry, which occupied two years (July 1914 to June 1916), was a direct outcome of this resolution. The objects aimed at were, in the first place, to obtain more exact knowledge than had hitherto been available as to the actual prevalence of consumption in India; secondly, to investigate the causation of the disease with special reference to any points of difference or contrast as compared with what has been observed in other countries; and, thirdly, to arrive at some definite conclusion as to what measures of prevention appear to give most promise of ultimate success. The problem of the spread of tuberculosis is so closely bound up with some of the most widespread of India's social customs and habits of life, that any practical measures would be doomed to disaster which were founded merely upon Western experience, and not corrected, with the most sympathetic caution, by reference to Eastern prejudices and feeling.

Furthermore, it had been boldly asserted that the only chance of success in dealing with a question of such magnitude lay in calling out a far closer co-operation between Government enterprise and voluntary effort than had hitherto been contemplated; and that at the present time such co-operation was possible; that in fact India was ready and willing to help and was only waiting for a "lead." Here again was a question of undeniable importance, and one that could only be settled, short of actually putting it to the test in practice, by intimate and careful personal inquiry from those amongst the Indian community whose opinions would command most respect.

The above prepares the way for a word of explanation regarding the limited scope of the present volume. India

presents to the tuberculosis expert an almost inexhaustible field for useful inquiry into the pathology of the disease, its special clinical manifestations in this country, its therapeutics, and the like. It will be found that in my suggestions for preventive measures, prominence is given to the necessity for such expert investigation. But in making a survey which was to embrace the whole of India, to have attempted to include such aspects of the subject, would have inevitably led to the thrusting into the background of matters which, for the immediate present, were more pressing. I have, therefore, confined myself almost exclusively to the consideration of the disease in its more general aspects, its prevalence in various parts of the country, its dependence upon various social conditions and customs, with special reference always to the question of possible practical measures of prevention.

A short account of the inquiry itself may be of interest; the methods employed in obtaining information will be seen to be in keeping with the nature of the problems in question. During the eleven months of actual travelling in India and Burma, covering a distance of nearly 35,000 miles, 85 cities were visited, including 29 out of the 30 which contain a population of over 100,000 inhabitants. The following Native States were included in the tour:—Hyderabad, Mysore, Gwalior, Indore, Bhopal, Udaipur, Jaipur, Jodhpur, and Bharatpur. At the presidency cities and provincial capitals from one to two weeks were spent, while at other cities the visits lasted as a rule only two or three days. The time was occupied largely with personal interviews and visits to institutions. Information and advice were sought from, and freely given by, heads of Governments, rajahs and administrators of native states, inspectors-general of civil hospitals, directors of public instruction, members of the staffs of the larger hospitals, civil surgeons, district magistrates, health officers and municipal secretaries. Missionaries of experience, both men and women, were everywhere consulted, as well as any other residents who were known to have taken an interest in matters connected with social reform or domestic hygiene. Especial efforts were made to secure personal interviews with influential Indian gentlemen at the various

centres, particularly with such as had already evinced interest in social progress, and who might later on be of assistance in carrying out the measures to be proposed.

Hospitals and dispensaries were visited, as were colleges, schools, industrial institutions, orphanages and, in many centres, jails and lunatic asylums. Special attention was paid to such recent developments in the various institutions as were more closely connected with the subject under inquiry:—open-air wards for consumptive cases, tuberculosis dispensaries, open-air schools, and the like. The larger sanatoria for tuberculosis treatment, with only a single exception, were carefully inspected. In addition to the large mass of information, verbal, written, and printed, which accumulated in the course of such a tour, every attempt was made to obtain the views, by correspondence, of those in a position to assist but who could not otherwise be reached.

Furthermore, in accordance with my instructions, advantage was taken at very many of the centres visited of opportunities for delivering popular lectures on the subject of "Consumption and its Prevention" to various classes of people. Apart from the value of diffusing knowledge on even so small a scale, such opportunities were useful as affording some idea of the probable response with which an educational propaganda on a far larger scale might expect to be met. Such lectures were for the most part delivered to audiences of college students, since for these there was no necessity for preliminary arrangements, but in many centres, popular lectures were given to the general public, and a few addresses also were given in the vernacular to unseen audiences of purdah ladies.

At a considerable number of centres, by the kindness of district officers, the opportunity was given of addressing the members of municipal committees and district boards, on civic responsibilities regarding overcrowding and sanitation, and other matters connected with the problem under inquiry.

Without entering into detail regarding these various lectures, it may be stated, that the response was, with scarcely a single exception, enthusiastic; while in most

cases the liveliest anxiety was evinced for some guidance as to ways in which the interest newly evoked might obtain an outlet.

At cities where there was a large body of medical men, whether European or Indian, meetings were arranged at which, after a short introductory address, a discussion was held on the subject of the local prevalence and causation of tuberculosis. The opportunities for obtaining a consensus of medical opinion afforded by such discussions were specially valuable.

The experience previously gained, during twenty-three years of active work amongst the people as a medical missionary, in two of the largest cities of Northern India, was of great assistance, not only in the actual task of obtaining the required information, but also in testing its reliability and in estimating the relative value, for purposes of the inquiry, of the various facts elicited.

Part I.

THE PREVALENCE OF TUBERCULOSIS IN INDIA.

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CHAPTER I.

IS TUBERCULOSIS ON THE INCREASE IN INDIA?

THERE is a widespread impression that tuberculosis is rapidly on the increase in India. The question, however, as to whether this increase is real or in the main only apparent, is one upon which there is a divergence of opinion. On the one hand it is believed that the disease has extended greatly during the last two or three decades and that its present rate of increase is such as to add seriously to the urgency of the problem of prevention. On the other hand it is held that this asserted increase is not confirmed by statistical returns and is for the most part attributable to more accurate diagnosis and improved methods of registration; that in fact tuberculosis has always been a serious scourge in India, but that it has only recently been diagnosed as such and its seriousness recognised.

Careful inquiry would seem to show that there is an element of truth in both the above views; that in certain areas the supposed increase is in the main merely apparent, but that in others, from well-defined causes, there has been an extension of prevalence, the reality of which cannot be denied.

At the outset it must be admitted that in this matter we can get no assistance from statistics. Poor and unreliable for the most part as are the present statistics regarding tuberculosis, those even of a few years ago, are so much less satisfactory still that a

comparison between the figures at successive periods cannot with any approach to truth be adduced either to confirm or to negative the assertion of increase. Even where, as in the case of some of the great cities, we have series of tuberculosis death-rates extending over a considerable number of years, the evidence which this would seem to give of only slight increase or even declining prevalence, is balanced by the extension of the disease to surrounding areas. The medical officers of health of the larger cities of India are unanimous in stating that there has been no real decrease, and almost so in the belief that in the crowded areas at least, actual increase of prevalence has occurred.

So far then as the matter may be regarded as one of importance, we are compelled to rely upon evidence other than that given by vital statistics. In any case it is certain that tuberculosis is by no means a recent disease in India. It is mentioned again and again in ancient Hindu literature, where its symptoms are accurately described and its treatment discussed in detail.*

So long ago as 1829 Conwell writes:—"It is a generally received error that the pulmonary disease in India is rare." And he adds that the error had formerly been shared by himself until on return to India, provided with improved means of physical examination (stethoscope), and obtaining access at the same time to a larger field of observation, he became convinced that the idea was a mistake.†

Now let it be freely conceded that recent advances in medical knowledge and diagnostic method have led to a far wider recognition of the disease, especially as regards its earlier stages, and that this coupled with improved registration does undoubtedly account for a considerable proportion of the increase in the prevalence of tuberculosis as recorded in hospital and other statistics. Are we, therefore, justified in comforting ourselves with the conclusion that there is no great present extension of

* Dr. Chandra Sekar, "Consumption in Madras," pages *26* and *27*.

† Hirsch, "Handbook of Geographical and Historical Pathology," Volume III, page 185.

the disease, that the evil though serious is not a growing one, and that the problem confronting us is the same in extent as well as in kind as that which faced administrators of half a century ago, the difference being in our own greater wakefulness? There seems to be very much evidence to prove that whatever may be thought regarding the greater cities, tuberculosis in its various forms has spread to a large extent in many regions where formerly it was almost unknown, and that it is becoming more and more prevalent in rural areas, instead of being confined to the towns.

In India, as in all parts of the world, there is a remarkable degree of variation in the prevalence of consumption in different regions. There are some more or less isolated areas, where even yet tuberculosis appears to be almost non-existent; others, where it certainly was so within the memory of reliable observers, who have watched the disease spreading widely as communication with more populous regions has become more free.

As has been repeatedly noticed in the case of "virgin races" in all parts of the world, so also in India, the inhabitants of such uninfected districts have shewn a marked degree of hyper-susceptibility to tuberculosis when they have migrated to parts where prevalence is considerable. This phenomenon, of which my inquiry has afforded abundant evidence, has an important practical bearing upon the problem of prevention.

From medical officers who have been stationed for some years at Gilgit and Chitral, I have received information as to the total absence of tuberculosis amongst the indigenous inhabitants of those regions, in spite of housing conditions most favourable to the spread of the disease. Cases are however even now said to be comparatively numerous amongst the Hindustani troops and followers stationed there, and extension to the local inhabitants will probably be only a matter of time.

As regards Kashmir, that well-known medical missionary and keen scientific observer, the late Dr. Arthur Neve, who was for 38 years continuously engaged in active hospital work both in Srinagar and in the Kashmir Valley, used to speak of the extreme rarity of both pulmonary and surgical tuberculosis in his early days

of work, and the statement is fully borne out by the statistics of the Mission Hospital. Phthisis has, however, of recent years become one of the principal causes of mortality in the State and a scheme for preventive measures is now under consideration.

Coming now to the North-West Frontier, Sir Sahibzada Abdul Qayyum, K.C.I.E., late Assistant Political Agent of the Khyber, has spent his whole life in close contact with the Afridi Pathans of Tirah. He says that 35 years ago consumption was unknown amongst them, while now its spread amongst the transfrontier villages is a matter of constant anxiety. He is positive also as to the great increase of the disease both in Peshawar City and in the district around. My personal experience of 17 years in the district confirms this opinion.

The Rev. S. S. Dease, M.D., has spent 34 years in work amongst the villages of the Kumaon, during the first ten of which he was Medical Officer in charge of several Government as well as Mission Dispensaries. He states definitely that in those years tuberculosis was almost unknown in the Kumaon villages; that in numerous cases Christian students sent for training to Bareilly became infected and had to return to their village homes, and that in many villages where the disease was before unknown it is now comparatively common.

The Rev. K. W. S. Kennedy, M.B., B.Ch., commenced work over 20 years ago in Chota Nagpur. Coming out from Ireland where tuberculosis was so common, he was at once struck by its extreme rarity in Chota Nagpur. He was able to watch the gradual and serious increase of consumption in Hazaribagh and the surrounding districts, dating it from the time when the climate began to have a reputation for being favourable for the treatment of the disease. This led to a gradual influx of cases from Calcutta and other parts of Bengal and in time the whole country side became more or less infected. Dr. Kennedy had noticed a similar "most remarkable increase" amongst the aboriginal tribes in Chota Nagpur and this he attributed to the growing practice for the men to go to work as coolies in Calcutta or in the Bengal coal mines for five or six months in each year. He had seen many cases in such families

and had found that the first to suffer had usually been to Calcutta.

This leads to the suggestion that the chief reason why increase in the great cities is not more marked than appears from statistics, is that a large part of their population is an immigrant one and that these people, when they become ill, almost invariably return to their villages, since they have the greatest horror of dying away from their own homes. Both from towns and village districts in the neighbourhood of Calcutta, Bombay, Lahore and other cities, I obtained ample evidence of the spread of consumption from the central city to parts around, within a considerable radius.

Whether it be from subtle causes connected with change of environment, or whether from a relatively increased susceptibility as compared with the city dwellers who have lived their lives exposed to infection, it is constantly found that these immigrants from healthier districts are the ones in the great cities who most frequently fall victims to consumption.

Just as in the case of Hazaribagh and Ranchi in Chota Nagpur so with the healthy highlands of the Deccan and the Central India plain. It is commonly recognised that for young people to go from Central India or the Deccan to work or study in Bombay or the "Konkan," involves a definite measure of risk of consumption, which needs to be specially guarded against by those who are responsible for their care.

As regards the increase of tuberculosis in such districts as those mentioned above, the evidence would seem to be conclusive. It is when we come to consider the cities of India that it becomes more difficult to speak with confidence. It is impossible to gauge with any accuracy the element of error represented by improvements in observation and diagnosis. People know more about the disease and are far more on the look-out for it, than before; it is natural that it should seem to be increasing.

There is nevertheless good ground for believing that in many of the larger cities also, there has been considerable and progressive increase during the past 30 years. In the case of some cities, such as Hyderabad (Deccan) and Hyderabad (Sind), I obtained what seemed to be excellent evidence of their comparative freedom from

consumption about 40 years ago, whereas now the prevalence is extreme. Such cities are for the most part situated in healthy districts and were therefore comparatively isolated from infection until the advent of railways.

The Hindustani word "sil" is the one which, in northern India, corresponds most accurately to the English "pulmonary phthisis," and it is not usually applied to early or doubtful cases. The more popular term "tap-i-diqq" has a looser and more inclusive connotation. Hakims of eminence in such cities as Delhi and Lucknow are unanimous in speaking of the marked increase of this special form of disease, *i.e.*, "sil," amongst their patients during the last 25 years.

Similar information comes from almost every part of India, the observers who are most emphatic and certain in their opinion that the disease is on the increase being the ones whose experience entitles their views to the greater respect. I have tried whenever possible to obtain the opinions of civil surgeons, doctors of "Lady Dufferin" hospitals, private practitioners, medical missionaries, as well as of non-medical zenana workers, selecting always for special inquiry those who have remained in the same district for 20 or 30 years. It is impossible to disregard the accumulated evidence of such as these, who mingling intimately with the people in their own homes, or seeing them day by day in outpatient rooms or hospitals, have watched the cases of tuberculosis becoming more and more common every year.

To sum up: the impression left upon the mind after careful inquiry, with comparison of such statistics as are available, is that many large areas in India, which 40 years ago were practically "virgin soil" to tuberculosis, have now become to a considerable extent infected; that phthisis has been for generations, probably centuries, a common disease of the larger cities, yet even in these there has been considerable actual increase during the last 40 years; that while in smaller towns and in the village districts it was formerly comparatively rare or even absent, yet in these during a similar period the disease has made its appearance and spread widely. The increase has been most marked in connection with those centres which have shown the greatest commercial and

educational development, and in the village districts which have been linked up with them by direct lines of communication.

Medical workers in India are all familiar with the sporadic cases of an infectious disease which occur in a city or district and give warning of an epidemic, the latter, however, not actually taking place until the occurrence of some event such as one of the great local fairs, or a religious festival or pilgrimage, which brings large bodies of people into contact with one another and provides the conditions which precipitate an outbreak. We are dealing with an epidemic which moves by decades instead of by weeks. May it not be true to regard as the "festival" in this case,—the long drawn-out exciting cause—the enormous social development which has taken place during the last 40 or 50 years ? This upheaval has given the opportunity for increased contact and spread of infection in three principal ways :—

1. By the substitution of the city mill and workshop for the old home industries.
2. By the multiplication of institutions, philanthropic, educational, etc., at a period when the importance of fresh air was imperfectly realized.
3. Most important of all, by the increase of means of communication between villages and towns.

The disease of consumption has emerged from the quiet of the zenana into the open life of the people; it has been spread from the cities far and wide amongst the village districts. The people know it, and on all sides are asking for guidance as to a remedy.

It may be objected that the point discussed in this chapter is after all of academic rather than practical importance. If it can be shown that the actual prevalence of tuberculosis is alarmingly great in various parts of the country, then of course a case is made out for preventive measures, whether or not the evidence is conclusive as to there having been *increase of prevalence* during recent years. This may be true, but nevertheless, if there is reason to believe that there is actual serious increase in prevalence, in spite of the sanitary progress that has been made, then surely the problem of prevention assumes a far more urgent and serious aspect.

The fact is that the advent of railways, and the increase of means of communication generally, by breaking down the old isolation which used to exist between districts, cities and villages, has removed one of the great safeguards against the diffusion of disease infection of all kinds. Similarly also as regards the present tendencies towards the removal of the barriers which have so long existed, shutting off religions, castes, and communities from mutual intercourse with each other. Such barriers, however inimical to progress they may have been, have undoubtedly served to limit the spread of disease, and with their gradual disappearance we may feel a reasonable anxiety lest diseases like tuberculosis, once limited to special classes or communities, may now become more and more widely and generally diffused amongst the population as a whole.

In any case, present-day social and industrial changes present a challenge to sanitary effort to be vigilant and active, since the very advances which seem to make for higher standards of healthy living, themselves bring dangers in their train.

The risk above alluded to was first brought definitely to my own notice by Major A. G. McKendrick, M.B., I.M.S., of the Pasteur Institute, Kasauli, in a memorandum from which I extract the following very suggestive paragraph :—

> "India at the present moment is in a heterogeneous condition, which is rapidly breaking down with the building of new railways. Districts previously partitioned from each other are now becoming connected. The "diffusivity" of diseases and influences of all sorts, is increasing and the safeguard of heterogeneity is fast disappearing. With this new state of affairs we are in the unfortunate—but very definite—position of knowing that the sanitation of India 50 years ago would be insufficient for the conditions at present existing, and that the sanitation of to-day is insufficient for to-morrow. Every sanitary reform will have its effect against this current, but may not make headway against it. Certainly with increased facilities for the

spread of disease, there will be increased facility for the spread of education. But sanitation is a difficult problem at best, and still more difficult in India; and it may be that in the future in spite of all improvements, we shall have public health not improving but even deteriorating. In the case of tuberculosis particularly, judging from the small amount of progress made in easy England, one would not be surprised if this were to occur in India."

CHAPTER II.

THE VALUE OF STATISTICS REGARDING TUBERCULOSIS IN INDIA.

A DIFFICULTY which confronts one at the outset of any inquiry in India as to the epidemiology of such a disease as tuberculosis is the paucity of statistics on the subject, and the unsatisfactory nature of very much of such as are available. Owing to the immense areas and populations which have to be dealt with, and the extreme fewness of those who are qualified by training to provide reliable information, the organization of such activities—fundamental from the standpoint of public health—as the notification of infectious diseases and the registration of cause of death, is still in a very early stage.

As regards the notification of tubercle, serious attempts have been made in the Presidency Cities to introduce a system of compulsory notification, but it has been found in practice impossible to enforce any regulations on the subject by penalties, and as a matter of fact notification has become purely voluntary, so much so that even in Bombay, where it was first introduced, it is believed that not more than about 3 per cent. of the fatal cases of phthisis are notified by medical men during the patient's lifetime. The question whether compulsory notification can be regarded as advisable under existing conditions of public opinion in India is discussed in Chapter XIX.

The general character of the vital statistics throughout India, and their limitations for purposes of

scientific investigation, are already clearly recognized by Government, and also by medical observers possessing any inside knowledge of Indian conditions. Their defects are the defects from ignorance of those—petty revenue or police officials, village watchmen, sweepers and others —who are their ultimate source of supply, and the attempt to make any general change in the present machinery for reporting would involve an expense altogether prohibitive.

For many years past, the headings under which mortality returns have been supplied to the Government of India and presented in the annual statistical reports have been eight in number, and are as follows:—

1	2	3	4	5	6	7	8
Cholera.	Small-pox.	Plague.	Fevers.	Dysentery and Diarrhœa.	Respiratory diseases.	Injuries.	All other causes.

It will be useful to discuss very briefly the bearing of this particular subdivision of vital statistics upon the problem before us. Of the above eight groups, the final one is obviously necessary, while in the case of numbers 1, 2, 3, and 7, the connection with tuberculosis is not intimate, and the margin of error, even with the present reporting machinery, is probably by no means very serious.

It is different, however, in the case of the remaining three groups: Fevers, Dysentery and Diarrhœa, and Respiratory diseases, in one or other of which we may assume that the great majority of cases of death from consumption are returned. These three headings represent not specific or distinct diseases, but large groups of affections roughly divided in accordance with what may have been their predominant symptom, whether pyrexia or diarrhœa, or cough. This division into groups was doubtless originally made in recognition of the fact that the most that can be

expected from untrained reporters is that they should distinguish the chief symptom in the illness that caused death, and report accordingly.

It would seem that under present conditions of reporting, the limits dividing these three groups from one another must be very uncertain and ill-defined; in fact some have questioned the utility, for the purpose of scientific inquiry, of attempting to separate them. It is obvious that the above-mentioned symptoms—fever, diarrhœa, and cough—are so continually mingled together in various diseases, two of them or even all three frequently occurring in the course of a single illness, that diagnoses based upon their presence can possess little real value. As a matter of fact the reporters themselves are sufficiently aware of their own limitations not to attempt the impossible, and therefore in the great majority of cases give the cause of death as simply "fever." In India, where this term is ordinarily used to signify a disease, which may be a cause of death, as apart from the mere symptom of pyrexia, it is understood as meaning "Malarial fever," and yet it is the general consensus of opinion throughout the country that not more than about one-third of the deaths reported as due to fever are really deaths from malaria.

Sir Leonard Rogers deals with this point in the following terms in his book "Fevers in the Tropics":—

> "**Mortality from Malarial Fevers in India.**—The vital statistics of the civil population of India show that 90 per cent. or more of the deaths are returned as being caused by fevers, and they have often been quoted as an evidence of the enormous mortality from malarial fevers. As a matter of fact they afford no indication whatever as to the real mortality from fevers in general, and still less that of any particular kind, as the deaths are reported by ignorant village headmen or watchmen, who return every kind of illness as 'fever.' Some general ideas as to the principal causes of death may be obtained from the results of an inquiry into 1,000 fatal cases in the very feverish district of Dinajpur,

in Lower Bengal. All the deaths returned as due to fever in one year in selected areas of the district were investigated by obtaining the history of the illnesses from the relatives of the deceased.

I thus found that one-third of the deaths attributed to fever were due to diseases such as dysentery, tumours, etc., in which fever was not even a marked symptom ; another third were caused by such diseases as pneumonia, bronchitis, *phthisis (the last constituting 9 per cent. of the total)*,* and typhoid; while the remaining third were probably due for the most part to malaria and kala-azar. * * * * * We thus arrive at the conclusion that at any rate in this specially malarial district the deaths due to malarial fever probably amounted to but from 20 to 25 per cent. of the total 'fever' mortality, which is still an appallingly high rate for such a readily curable disease."†

Another interesting series of inquiries of a similar nature, conducted with most painstaking care at Cossipore Chitpur, near Calcutta, by Dr. Brahmachari, the Health Officer, and extending over five years, shows no less striking results. The actual cause of every death was, as far as possible, ascertained by means of careful inquiries made at the homes of those who died, all doubtful cases being referred for special consideration to the Health Officer himself.

The following table gives the result of these inquiries for the year 1913, and it shows what was actually found to be the cause of death in the various cases returned under the heads of fever, dysentery, respiratory diseases, etc. From these figures it will be seen how large a proportion of cases of phthisis are hidden away under the different headings, and how comparatively few of the immense number of cases returned as "fever" really died from malaria.

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* The italics are mine.

† Sir Leonard Rogers, "Fevers in the Tropics," Second Edition, p. 200.

Investigation at Cossipore Chitpur.

Reported as due to—	*Found to be due to—*																
Cause.	Number.	Malaria.	Typhoid fever.	Fever undiagnosed.	Plague.	Small-pox.	Measles.	Cholera.	Dysentery.	Pneumonia.	Phthisis.	Other infectious diseases.	Other respiratory diseases.	Diarrhœa.	Other diseases.	Injuries.	Still-births.
Fever	527	88	62	10	4	...	17	4	54	95	66	8	14	1	86	...	...
Plague	44	...	1	...	38	...	...	...	1	1	...	2	...	...	1	...	...
Small-pox	13	...	...	..	...	2	6	...	...	...	..	1	1	1	...	..	...
Measles	21	...	..	..	..	...	21	...	...	...	...	...	...	...	..	...	...
Cholera	176	..	...	2	1	...	2	159	2	2	...	1	1	3	2	...	...
Dysentery, diarrhœa ...	239	8	5	...	..	...	2	3	144	2	14	1	1	25	25	...	...
Respiratory diseases ...	247	1	...	...	...	...	8	...	2	69	50	2	65	34	...	...	..
Injuries	23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	19	...
All other causes ...	437	34	1	3	1	...	1	2	10	23	4	66	21	8	236	...	1
Still-births	48	...	...	...	...	...	...	...	...	...	..	...	...	..	...	...	48
Total ...	1,727	131	69	15	44	2	57	168	213	192	134	80	103	38	385	19	49
Ratio per mille per annum ...	...	2·62	1·38	0·30	0·88	0·04	1·14	3·36	4·26	3·84	2·68	1·60	2·06	0·76	7·70	0·38	...
Ratio per cent. of total deaths due to ...	...	7·7	4·1	·9	2·8	·1	3·4	10·0	12·6	11·4	7·9	4·7	6·1	2·2	22·8	1·1	...

Combining the returns for the five years 1909—1913 inclusive, we find that out of 2,181 cases returned as "fever" only 322 or 14.7 per cent. of the whole were due to malarial fever, while no less than 761 were actually found to be due to respiratory diseases, not very much less than the total number reported as due to this cause, which was only 1,012.

Again, the total number of deaths found on investigation to be due to phthisis was 522 ; these had been reported as follows :—

Deaths actually due to phthisis.	Cause of deaths as reported.				
	Fever.	Respiratory diseases.	Dysentery.	Cholera.	Other causes.
522	236	239	24	5	28

From these figures it appears that, as a result of careful verification extending over a period of five years, out of the total number of deaths reported as due to "fever," no less than 10.8 per cent. were found to be really due to phthisis (a proportion closely approximating to Sir Leonard Roger's 9 per cent. quoted above), while of those reported under "respiratory diseases," 23.6 per cent. were due to the same cause.

Similar investigations have been carried out under the direction of Dr. C. A. Bentley, Sanitary Commissioner with the Government of Bengal, in several other districts of the Presidency. Thus in Murshidabad 5.4 per cent. of the deaths returned as from "fever," were found to be due to phthisis ; in the Nadia District the proportion was 7.2 per cent.; while in Jessore, out of 398 deaths registered as from "fever," no less than 36, or 9 per cent. were from phthisis. It was found that acute and chronic malaria together accounted for about one-third of the total "fever" deaths. In one area of the Dacca district, the result of a test inquiry into 910 deaths registered under the heading "respiratory diseases," was to shew that 323 or 35.5 per cent. were due to phthisis, 319 to pneumonia, and the remaining 268 to other respiratory diseases.

Statistical returns of a parallel character might be obtained from all parts of India and would, I feel sure, give the same general results. Those given above afford some indication of the unsatisfactory nature of the assistance which can be hoped for from the ordinary vital statistics in an investigation such as this. They seem also, however, to show how inextricably the reports of deaths from these three classes of disease are intermingled under the present system of classification and how erroneous may be any deductions which are founded upon such returns.

It is difficult to avoid the impression, after a careful examination of numerous Sanitary Administration Reports and statistical returns, that under the present system of classification, a very large number of deaths from such diseases as phthisis, pneumonia and bronchitis, are entered under the heading of "fevers," instead of under that of "respiratory diseases."

It does not come within the scope of this book to suggest directions in which the system of recording vital statistics might be improved. It is satisfactory to know that the authorities are well aware of defects such as those which have been alluded to, and especially that the plan of correcting the results of the more general returns, by detailed investigations over localised typical areas, or amongst selected limited communities—on similar lines to those undertaken in Bengal—has been favourably considered and is likely to be widely adopted. Such detailed enumerations, based on verification after inquiry by trained medical men, promise results of real scientific value, and in using them for the purpose of making generalizations regarding more extensive fields, observers would be dealing with actualities and would be on firm ground. It will be long before we can expect to have deaths from phthisis reported and registered as such with accuracy all over India; even now, however, local registers, in villages as well as towns, contain frequent entries of consumption as a cause of death under one or other of its vernacular names, these being included under one of the eight main groups,—usually "respiratory diseases"—in preparing the general returns. In the meantime we may perhaps take it as

approximately true that in areas in which, as in Bengal, tuberculosis is known to be decidedly prevalent, phthisis will account for from 8 to 10 per cent. of the deaths registered under the heading "fevers," and from 18 to 25 per cent. of those under "respiratory diseases."

In many of the larger cities of India, the system of registration of deaths under their causes is so far advanced under medical supervision as to enable an approximate tuberculosis death-rate to be stated. It is, however, only in the Bombay Presidency, so far as I am aware, that the reporting of tuberculosis deaths as such both in urban and rural areas has been carried on for some years as a routine practice. As a result, the statistical returns of the Bombay Sanitary Administration, are, so far as tuberculosis is concerned, far in advance of those in other provinces in completeness and accuracy.

The Nomenclature of Tuberculosis in India.—The nomenclature of a disease is of such importance with regard to its correct registration that a few words upon this aspect of our subject may not be out of place at this point. It must be remembered that in the Indian Empire we are dealing not with a single country, people, or language, but with an extensive and varied area containing many different races, amongst whom twenty or more entirely distinct languages are spoken. From the words in common use to describe the disease in various parts of the country, it is easy to judge to what extent tuberculosis in its various forms is recognized as a separate and distinct affection; this in turn has a most important bearing upon the reliability of our sources of information regarding it.

In proportion as consumption is regarded as a separate entity, and is labelled by a distinct name commonly understood, we may expect to have more complete and correct records of its prevalence. The existence of a word describing the disease both clarifies thought concerning it, and facilitates the work of reporting and recording cases. Per contra, when the disease can only be described in terms of some special characteristic or predominant symptom, there is

far less accuracy in reports of fatal cases, and corresponding uncertainty in our available statistics.

Over a great part of Western India, and almost the whole of the Southern part of the Peninsula—comprising the following language areas:—Gujerati, Marathi, Kanarese, Telegu and Tamil,—there is one word of Sanscritic origin, "*kshai*," which is used almost universally, by rich and poor, in villages as in towns, to describe pulmonary consumption or phthisis, *and is not used for any other condition.* This fact is sufficient evidence of the general recognition of the disease by the people, while it, perhaps more than any other cause, has enabled the sanitary authorities of the Bombay Presidency to include phthisis amongst the disease-headings under which deaths are classified, and thus obtain local tuberculosis death-rates. This has as yet been regarded as impracticable in almost all other parts of India.

Amongst the educated people inhabiting the towns of Northern India, and with Mahomedans generally, the Urdu words, "*Tap-i-diqq*," or simply "*diqq*" (*ki bimari*)—"the troublesome sickness"—and "*sil*," are in common use. Of these terms the former is the more general one, while the latter is mostly restricted to advanced cases, especially those accompanied by hæmorrhage and profuse expectoration. The less educated Urdu-speaking people use the descriptive combination, "*khansi-bukhar*," or "cough-fever," while the Punjabi and Hindi equivalent for this, "*kang-tap*," is in common use throughout the villages of the Punjab and United Provinces. The Pathans of the North-West Frontier speak of "*loya taba*," "the great fever," and Persian-speaking Afghans use the term "*bad-i-kabir*," "the grievous sickness."

In Rajputana the word in common use is "*Raj-i-yakhsmi*,"—"the king of diseases"—and throughout Bengal the disease is known as "*khoy-kash*" or "*jaksha-kash*." Over Northern India the word "*gilti*" (pl. "*giltian*") is in common use to describe tuberculous glands.

It is in Burma that the indefiniteness of disease nomenclature places the greatest obstacles in the way of statistical inquiry. There is no one word to denote

phthisis, and indeed scarcely one to denote any other disease, all illnesses being merely described according to their symptoms. There is one compound term which is only used for phthisis, "*chaung-so-thwe-pa*"—"cough-with-blood-coming," but of course this has only a partial application. The words "*miyat*" (for women), and "*doola*" (for men), are used to signify cases of anæmia and debility with wasting, and inquiry from many sources shewed conclusively that these terms are in very frequent use in registers to describe cases of death from consumption.

It would seem as if the accurate recording of tuberculosis statistics in Burma would be almost impossible until some one word can be popularized to connote the disease.

It should be remembered that the correct registration of deaths from such a disease as consumption is not usually a matter that calls for medical knowledge. In its early stages, there may be the greatest difficulty in diagnosis, but long before the patient breathes his last, his relations and friends usually know quite well what the illness has been. They recognise it but may be unable to label it with its proper name for purposes of registration, hence the importance of having distinctive terms for the disease which will be understood by all.

Hospital Returns.—Leaving now vital statistics and turning to those supplied by the various hospitals and dispensaries, it might be supposed that here we were on a wholly different plane as regards accuracy. This may be so as regards certain very limited areas of the field, but as to the great mass of the statistical information supplied, those who are most closely acquainted with the sources from which it is obtained regard it with the least respect. The cause of inaccuracy in hospital returns is for the most part the lack of time, professional keenness, or knowledge on the part of those whose duty it is to make the necessary entries in registers.

I am now dealing with returns from out-patient dispensaries and from the out-patient departments of the larger hospitals. In-patient returns are on a far higher level as to medical reliability, but are subject to different fallacies which will be mentioned later.

It is usually agreed that in all but the largest hospitals the returns founded upon diagnoses in the out-patient rooms, or at all events, upon the entries in out-patient registers, cannot be regarded as possessing much value. With a crowd of 200 or 300 patients attending in a morning, needing as they do, because of their ignorance, more individual attention and detailed explanations than is the case in Western countries, what wonder that diagnosis as well as treatment tends to be rapid and to be based largely upon symptoms? If however, there is difficulty in obtaining reliable returns from the out-patient departments of city hospitals, what of the multitude of dispensaries scattered throughout the smaller towns and villages of India and manned by medical officers of the hospital assistant or sub-assistant surgeon class? Here it is too often not time but knowledge that is lacking.

There are multitudes of medical officers of the lower grades, who are doing invaluable work in treating common ailments among the people, but who have never received the requisite training to enable them to form diagnoses of real scientific value, and who are often content to diagnose and enter their cases as "cough," "bronchitis," "fever," etc. Is it to be wondered at that in a town of 35,000 inhabitants, where by all accounts the prevalence of tuberculosis is considerable, the annual hospital returns, including both the civil hospital and a branch dispensary, should show a total of only 7 cases of tuberculosis?

Whilst fully recognising the great improvement which has taken place in the medical qualifications of sub-assistant surgeons during recent years, there are nevertheless very many medical men working in the smaller dispensaries, who cannot be expected to correctly differentiate between the various forms of disease, and yet it is necessary for them to fill up and duly hand in to their headquarters the identical form of detailed classification of diseases which is in use in the great hospitals of the presidency cities. These are collated along with the similar returns supplied by large hospitals, founded it may be upon the diagnoses of trained experts, the resulting totals being thus made up of materials differing widely as to scientific value. As a result of

difficulties such as these, which seem unavoidable at the present stage of development of medical relief in India, I found during my tour of inquiry, that although detailed returns of cases of tuberculosis treated as out-patients in hospitals and dispensaries were everywhere available, yet I was constantly warned not to place much reliance upon them as giving any true indication as to prevalence.

Finally, as regards returns of hospital in-patients we may assume the substantial accuracy of these in so far as they depend upon care in diagnosis. This, however, by no means implies that they are of any great use in determining the prevalence of such a disease as consumption amongst a population. In the West, where medical aid is everywhere available it may be roughly assumed that the great majority of sick people seek and obtain it. No such assumption can be safely made as regards India ; not even for the cities, and far less for the immense village population. Indeed in the Madras Presidency it was recently computed that not more than one-seventh of those who were sick attended for treatment at the various hospitals. This is especially true in the case of phthisis, since its prevalence is greatest amongst women in zenanas, who naturally are averse to leaving their homes in order to obtain medical aid.

The present mode of classifying disease tends greatly to impair the value for scientific purposes of the ordinary hospital returns. The form, in which cases are classified for statistical purposes, contains headings, some of which have a regional, and some a pathological significance. This being so, it follows that any given case may be, with equal correctness, entered under either the one or the other group, the almost inevitable consequence being that those whose diagnostic skill is imperfect tend to select the regional headings for most of their entries. Such a heading for example as " diseases of organs of locomotion " has almost irresistible attractions for the inexperienced or untaught diagnostician, who is thus saved from all necessity of deciding whether a doubtful case of bone or joint disease is one of tubercle, syphilis, rheumatism, or something else ; while for an ordinary case of " scrofulous

glands" the heading "inflammation and suppuration of lymph glands" is quite correct and seems more definite than the general pathological division, "other tubercular diseases." This difficulty has a most important bearing upon the subject of the comparative prevalence of the various forms of tuberculosis and will be alluded to again later on.

In a few of the largest hospitals registration of cases is based upon the final diagnosis as entered on the case-sheet when the patient is discharged, but in the majority of them, the returns are founded upon the entries made when the patient is first admitted from the out-patient room as, *e.g.*, "arthritis of knee," "tumour of kidney." In the one case the natural heading for classification purposes will be "diseases of organs of locomotion," in the other, "diseases of the urinary system." While in theory the original diagnosis should be altered in the register when the case is more definitely diagnosed in the wards, yet an inspection of many registers and case-sheets shows very clearly that in practice this is rarely done. The addition of a single letter such as T=Tuberculous, S=Syphilitic, or R=Rheumatic, etc., to the regional entries in in-patient registers, might greatly increase their value for statistical purposes. I am informed that the forms used for Dispensary returns are being revised in accordance with the new Nomenclature of Diseases. This should lead to the removal of some at least of the difficulties mentioned above.

Before leaving this subject, there is another matter which seems worthy of notice, since it has no small effect upon the correctness of returns both for in-patients and out-patients. An observation has been made to me many times by members of subordinate grades of the Medical Department, expressed in some such words as these :—"There is little encouragement for us to take real pains over *medical* work. Surgical operations and their results can be more definitely recorded, and it is for *surgical* work that credit is usually given. Careful medical work takes more time but earns little praise." I cannot but think that there is a measure of truth behind this complaint, and, if so, it is a matter for very serious consideration. Are medical students in India being turned out as well

equipped for the medical side of their work as they are for the surgical? It is constantly said that the Indian people have far more confidence in Western surgery than in Western medicine. May not the reason partly be that they see a higher standard in the case of the one than of the other? Certain it is that wherever there is a physician, whether European or Indian, who takes scrupulous care in diagnosis and treatment, and is as keen after medical cases as is the surgeon for operations, there is no lack of appreciation on the part of the Indian population within reach.

There is no disease in which for successful treatment early diagnosis is of more vital importance than in the case of phthisis; probably no disease in which in India to-day failure to detect its early physical signs so often results in disaster for the patient. It need hardly be said that in the above remarks reference is made to work in the district stations, and not to that of the hospitals in the greater cities.

We may conclude this chapter with two statements which will be found to admit of general application and which depend upon obvious causes already alluded to, firstly, that with the improvement of diagnostic methods in a hospital, the statistical returns for 'fever' will decrease while those for tuberculosis will increase; and secondly, that the advent to a city of a Health Officer possessing any special knowledge of tuberculosis will have as its unwelcome but inevitable sequel, a considerable rise in the number of deaths reported as due to this cause.

CHAPTER III.

TUBERCULOSIS IN RELATION TO CLIMATIC CONDITIONS; PREVALENCE IN RURAL AREAS.

The distribution of tuberculosis in India follows the same general lines and is dependent upon the same causative factors, climatic and social, as have been observed in other countries. In attempting to adjust the facts as regards the prevalence of tuberculosis to the ascertained conditions obtaining in the various regions of India it is necessary to lay special emphasis upon the provisional and tentative nature of this section of our subject. The great paucity of authoritative statistical returns makes it impossible to do more regarding the different areas, than draw comparisons between them, based for the most part upon a large body of independent testimony which has been gleaned from those observers, whether Indian or European, whose experience seemed to entitle their opinions to respect. While every effort has been made to obtain reliable information in support of the various statements made regarding local prevalence, yet it may well be that some of these statements may call for modification in the light of more accurate local knowledge, and any comments or corrections will be welcomed.

The bearing of civilization, with its cities, railways and institutions, upon the prevalence of tuberculosis in India, will be discussed in a subsequent chapter; our present object is to consider the natural features of the country with reference to the disease, apart from the irregular incidence which has resulted in various places from great aggregations of people.

In practice, however, it is not possible to dissociate the climatic from the social elements in regard to the prevalence of tuberculosis in a given locality. Prevalence depends upon infection, and be the climate what it may, if there are crowded cities whose conditions

as regards sanitation, overcrowding, etc., are such as to greatly favour the spread of the disease, no excellence of climate will be of much avail in preventing it. Where a specially good climate coincides with marked local prevalence, it will usually be found that the district is recognised as being favourable for the treatment of such cases as do arise. As instances of such cities, where considerable local urban prevalence coincides with climatic conditions favourable for cure, may be mentioned Quetta, situated in the Baluchistan highlands; Indore, on the Central India plain; and perhaps most of all Hyderabad (Deccan), where prevalence of tuberculosis is extreme and yet the climatic conditions in the country surrounding are decidedly good.

The following climatic factors have been mentioned as of chief importance in the treatment of consumption: "low atmospheric pressure, infrequency of winds, marked dryness of atmosphere, inconsiderable or transient fog, very low rainfall, prolonged duration of sunshine, a high actinic value of sunlight, intensity of heat rays and pure air of high radio-activity" (Dr. A. Rollier of Leysin). This statement prepares the way for the largest and, I believe, the truest generalization that can be made as to the epidemiology of tuberculosis in India, namely, that the plateaux of India with (except during the actual monsoon season) their small rainfall, low relative humidity, dry clear atmosphere, and high mean temperature are the more favourable regions. The high table-lands of Rajputana, Central India, the Central Provinces, the Deccan and the Mysore plain are all very favourable in comparison with other parts of India both as regards the general prevalence of tuberculosis, and as to the effect of their climate in the treatment of sufferers from the disease.

In the same category as regards prevalence may be included British Baluchistan and the hills of the North-West Frontier Province, the higher parts of Kashmir with Chitral and Gilgit, the hill country of Chota Nagpur (a continuation of the Satpura Range), both Central and Lower Assam, and the highlands of the Madras Presidency south of Mysore, and including Coorg.

In the case of almost all the above-mentioned areas additional evidence as to the comparatively low prevalence of tuberculosis is afforded by the greater susceptibility of their inhabitants shown when they migrate to less favourable parts. This fact has been constantly noted in the case of families from the Deccan coming down to live in the Konkan (the low-lying country along the western sea coast), and in those leaving Ranchi or Hazaribagh to live in Bengal or in the lower parts of Bihar and the United Provinces.

Passing now from these most favourable regions to those in which the prevalence of tuberculosis in the village districts, while considerable, is still not sufficient to be a cause of grave anxiety, the following would seem to occupy a more or less intermediate position as regards the prevalence of the disease:—the Sind Desert and south-western portion of the Punjab ; the north-east corner of the United Provinces around Gorakhpur, with the adjacent parts of Bihar, north of the Ganges; the whole of Orissa and the whole of the Madras Presidency with the exception of the Malabar Coast and the southern hills.

The remaining parts of India appear to be for the most part decidedly unfavourable as regards tuberculosis; its prevalence even apart from the great cities is considerable and the climatic conditions seem to be less satisfactory than elsewhere for the treatment of those already suffering from the disease. These unfavourable areas comprise the Delta of Bengal, the eastern and western Indo-Gangetic Plain including the whole of the Punjab except the south-western corner, the valleys of the North-West Frontier Province, and lastly Guzerat and the western littoral, especially the Malabar Coast.

There still remain the sparsely peopled higher slopes of the Himalayas which should be classed in the first or "favourable" group as regards prevalence of tuberculosis; the large northern states of Nepal and Bhutan, which most probably come into the second or "less favourable" group, while the lower slopes of the Himalayas, especially the swampy districts of the Terai, should probably be included in the third group.

It would be possible to further subdivide these three classes without any sacrifice of truth, by separating Chitral, Gilgit and the higher hills, together with some of the isolated districts in the Central Provinces and Chota Nagpur which are inhabited by aboriginal tribes, into a "most favourable" group, in which the tuberculous infection would seem not to have penetrated as yet to any very large extent; and at the other extreme by including in a "most unfavourable" group, Lower Bengal, the southern part of Bihar, the United Provinces except the north-east corner, the Central Punjab and the Malabar Coast.

As regards Burma, the dry region in the northern part of the country should be classed with Rajputana and the other favourable areas while the whole of Lower Burma should be included in the second group. The climate throughout this area is warm and damp but the absence of cold at any period of the year saves it, as in the case of Southern India, from being decidedly unfavourable.

No attempt has been made to give a numerical significance to the various groups mentioned above; this must await the time of improved methods as regards vital statistical returns. There is a general, though by no means accurate, correspondence between the tuberculosis prevalence in the various regions of India and the general death-rate in those regions. Our knowledge at present does not justify us in giving tuberculosis death-rates for the country at large; tuberculosis is not included among the headings of diseases under which deaths are returned in the ordinary vital statistics. The mortality from this cause is divided between "fevers," "respiratory diseases," and "other causes," the first of these receiving probably the larger share. It may, however, be stated generally that the degree of prevalence dealt with in these large groups, referring as they do to rural areas and depending largely upon climatic causes, is far less than that which we shall have to study later in connection with the great urban populations.

It must be remembered that what has been said above as to the climates of healthy regions such as Rajputana or the Deccan, takes no account of the

prevalence of tuberculosis in some of the cities which they contain. As will be seen in the next chapter, Jaipur and Ajmer in Rajputana, and Hyderabad in the Deccan are centres where the prevalence of the disease is extreme.

Bombay is the only provincial area in which phthisis is included as a separate heading in making the mortality returns, and where as a consequence official tuberculosis death-rates both rural and urban are available. Even so it is acknowledged by those best able to judge that the number of cases reported falls very far short of the truth. In 1918, 12,907 deaths from phthisis were recorded as compared with 12,554 in 1917, equal to a death-rate of .85 and .83 for the Presidency proper. For the Guzerat, Central, Southern and Western Registration Districts, respectively, the total deaths were 4,740,-4,596, 1,791 and 1,780, compared with 4,222, 4,295, 1,666, and 2,371 in 1917. The death-rates for urban and rural areas respectively for the four Registration Districts are given below, from which it will be seen how markedly the urban rates exceed the rural ones. The tuberculosis death-rates for individual cities will be found in the following chapter (page 47).

Guzerat[1] Registration Dis.			Urban,	1917,	3.34;	1918,	3.34
„	„	„	Rural,	„	1.02;	„	1.04
Central[2]	„	„	Urban,	„	1.69;	„	2.17
„	„	„	Rural,	„	0.76;	„	0.77
Southern[3]	„	„	Urban,	„	1.35;	„	1.46
„	„	„	Rural,	„	0.22;	„	0.44
Western[4]	„	„	Urban,	„	1.7 ;	„	0.88
„	„	„	Rural,	„	0.54;	„	0.40

In Sind there were only 595 deaths reported as from phthisis, 71 per cent. of which were from Karachi and Hyderabad towns.

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[1] Containing Ahmedabad, Broach, Surat, etc.
[2] Containing Ahmednagar, Poona, Satara, Ratnagiri, etc.
[3] Containing Belgaum, etc.
[4] Containing Alibag, Bandra, Thana, etc.

The following table gives the urban, rural and total death-rates from phthisis in the separate districts of the Bombay Presidency during 1915:—

Name of district.	Death-rate per mille from Phthisis—1915.			Remarks.
	Urban.	Rural.	Total.	
Ahmednagar	·62	·19	·22	
Poona	1·74	·37	·64	
Sholapur	·90	·15	·26	
Satara	·51	·42	·42	
Ratnagiri	1·52	1·80	1·79	Note high rural rate.
Belgaum	1·96	·52	·61	
Dharwar	1·15	·42	·52	
Bijapur	·81	·27	·31	
Kanara	1·18	·30	·37	
Surat	2·26	·64	·99	
Broach	2·02	·46	·79	
Kaira .. .	1·67	1·11	1·13	
Panch Mahals	·92	·15	·23	
Ahmedabad	3·84	·74	1·71	High rate due to Ahmedabad City.
Karachi	1·22	·05	·42	
Hyderabad	3·31	·06	·52	
Nawabshah	2·60	·03	·09	
Thar and Parkar ..	·34	·06	·06	
Larkana	·46	·01	·03	
Sukkur	·02	·01	·01	
Upper Sind Frontier ..	...	·01	·01	

In the case of rural areas around Bombay, the prevalence of phthisis is believed by all the local authorities to be in large measure a consequence of an actual spread of the disease from Bombay City to the districts. This fact which is common to all large manufacturing cities in India, but the truth of which has been questioned by some, has been repeatedly emphasized in reference to Ratnagiri and other districts which supply labour to Bombay. The following is taken from the report for 1918, of the Sanitary Commissioner with the Government of Bombay, para. 74 :—

> The phthisis rural death-rate in the Konkan districts exceeds that in the districts above Ghats. The phthisis death-rate in those areas that supply labour to Bombay continues to be high. In this connection the Deputy Sanitary Commissioner, Western District, writes :—
>
> "The labourers employed in Bombay mills are mainly drawn from Kolaba and Thana. These mill hands, living in overcrowded chawls, are necessarily much more exposed to the chances of infection than the labourers of the country who live and work in the open air. These Bombay labourers when too ill to work return to their houses in Kolaba and Thana to spread the infection and die."

In a large village district of Travancore, an inquiry kindly instituted by the Salvation Army, which has workers residing in almost every village, resulted in the discovery of only 167 actual cases of consumption amongst a total population of over 130,000. Amongst such a large number, however, a certain proportion of cases would inevitably be overlooked.

On the other hand, a careful enumeration carried out by an experienced medical man in five adjacent villages of the Central Punjab, gave the following result :—

Total Population.	Cases of Pulmonary T.	Cases of Surgical T.	Deaths from T. in 1914.	T. death-rate.
2,571	23	40	6	2·3

In one rural district of Lower Bengal, Sir Leonard Rogers found by careful inquiry into the mortality

returns, that of the total number of deaths returned as from fever, 9 per cent. were due to phthisis.

It may be of interest to discuss briefly some of the natural features of the geographical grouping above suggested in relation to their influence in limiting or encouraging the spread of tuberculosis in the community, or the development of the disease in the individual.

At the outset we come upon the difficulty of separating climatic from social elements. Some of the most favourable areas seem to owe their freedom to a literal absence of infection due to their isolation from intercourse with other parts of the country; such are the remote districts of Chitral, Gilgit and the higher Himalayas and some of the hill districts inhabited only by aboriginal tribes. Again, temperature exerts its influence far more by affecting customs, habits and habitations of the people than by any direct effect upon the disease. There can be little doubt that the greatest cause of the comparative freedom in Central and Southern India is that a warm and equable climate favours an open-air life, and at least does not compel closed-up dwellings; while it is no less true that one outstanding reason of the great prevalence in the Punjab and the north is the general lack of ventilation, since a more "closed-up" life is encouraged and to some extent perhaps enforced by the extreme cold of the winter and, to a less degree, by the fierce heat of summer. Furthermore, the distribution of the various races of India, and especially the existence over large areas, of certain social customs which will receive mention in a future chapter, tend greatly to modify the degree of prevalence of tuberculosis. Assam and the country districts of Burma seem to owe their comparatively favourable position regarding tuberculosis partly to climate influencing social habits and partly to the non-existence of customs prevailing elsewhere.

The natural features of the country influence the spread of the disease indirectly in certain other ways. Thus :—

(*a*) **Fertility of the Soil.**—Where the soil is productive, the people tend to be prosperous and well-fed, and this, other things being equal, is a strong safeguard against such diseases as consumption. Thus, for

instance, in the Berars the soil is very fertile and the people well-fed, the women work largely in the open air and only to a very slight extent does the custom of purdah prevail. Hence the specially light incidence of tuberculosis in this area. Where, however, as is usually the case, fertility leads to concentration of population, other and unfavourable elements enter into the problem. Some of the worst tuberculosis areas of India are over-populated because of their great fertility.

(*b*) **Abundance of Water accompanied by Malaria.**—There is no doubt that malaria in very many cases, by the enfeeblement of the constitution which it produces, prepares the way for consumption. Hence when the natural conditions of a district are such as to lead to great prevalence of malaria, this is an important predisposing cause of tuberculosis in the area affected. Much of the extreme prevalence of the disease in Lower Bengal and in the Himalayan Terai is probably due to this cause.

(*c*) **Rivers and other Natural Features facilitating Commerce.**—It is a most unfortunate fact that the climatic and social features of a region not infrequently tend to co-operate in producing conditions favouring the prevalence of consumption. The extensive low-lying plains through which run the great waterways of India would from purely climatic reasons be naturally amongst the regions where consumption abounds. These same natural features, however, determine the position of great commercial centres where population is overcrowded, and encourage the establishment of numerous railways, whereby the village districts are brought into close contact with the towns. In such areas, therefore, many factors seem to converge in increasing the prevalence of tuberculosis and in producing unfavourable conditions for those who suffer. It has been frequently observed that patients who contract phthisis in Bengal seldom recover so long as they remain in the Presidency.

Of those climatic conditions which have a direct effect upon the prevalence of tuberculosis in a locality I should be disposed to give the greatest prominence to humidity. A dry climate is almost always a healthy one, and when

dry atmosphere co-exists with a high mean temperature we have, generally speaking, the best conditions that India can afford both as regards the prevalence of consumption and its successful treatment. Rajputana, with its exceedingly low rainfall, sandy soil and almost continuous sunshine, is the best example of such a favourable climate. The combination of dryness of atmosphere with a low mean temperature, such as is found in so many of the European mountain health resorts, is with difficulty obtained in India within limits of accessibility. In most of the mountain regions at moderate altitudes, climatic conditions, which are good during early summer and early winter, are made less favourable during the remainder of the year by extreme humidity combined with low temperature and wind.

The great central elevated plain of the Indian Peninsula seems to owe its comparatively favourable position in the scale less to any one special cause than to the combination of moderately good conditions together with the absence of those factors which are distinctly deleterious. Thus for about nine months in the year its humidity is decidedly low; altitude as well as the general conformation of the country encourages satisfactory drainage; there is fertility of the soil with little congestion of population, few large cities and not many railways, with consequently no very active interchange of population between towns and villages. Lastly, at no season of the year is the cold so severe as to force the people to remain in closed dwellings.

A moderate degree of humidity when combined with a fairly high and equable temperature is by no means unfavourable as regards tuberculosis. These are the conditions which, speaking generally, obtain in the Madras Presidency and it is the impression of those best able to judge that the prevalence, which is considerable throughout this area, is referable in the main to social and not to climatic conditions, while the climate is not considered unfavourable for the treatment of the disease.

The combination of an excessively moist atmosphere with a constant high temperature is undoubtedly unfavourable for the treatment of cases of phthisis and

prevalence seems usually to be high where these conditions are found. The reason of this probably lies in the diminished power of resistance to disease which seems to accompany a damp hot climate. I do not feel able as yet to suggest any satisfactory explanation of the fact, which seems to be undoubted, of the much greater prevalence of tuberculosis along the West Coast as compared with the East. Humidity and rainfall are approximately the same in the two areas, the difference in prevalence may possibly be connected with a greater activity of commerce and intercourse along the Western than the Eastern Coast.

A damp atmosphere coinciding with low temperature seems to provide the most unfavourable conditions for tuberculosis, and the reasons for this are not hard to discover; some of them have been already alluded to. Where a high degree of humidity co-exists with considerable relative diurnal variations in temperature the evil effect is intensified owing to the increased tendency to body chills. Although great humidity is usually accompanied by a comparatively equable temperature, yet, partly no doubt owing to the diminished evaporation from the surface of the body, sensitiveness to small variations in temperature is much increased when the air is loaded with moisture. Furthermore, over the greater part of the unfavourable areas of North India the diurnal variations of temperature during the cold season are accompanied by corresponding diurnal variations in relative humidity, or in common language, clear warm days are followed by chill and moisture in the nights and early mornings. (This diurnal variation of relative humidity is shown clearly in meteorological charts.) It is this same combination of lessened temperature with increased humidity which gives its injurious character to some of the local prevailing night winds in South India and elsewhere. Where there are great seasonal variations the damp warmth of the summer tends to reduce the strength and with it the power to resist the damp chills of the winter. In one malarious district of Bihar I was told: "The people around here have no chance. They go down with malaria in the autumn, then when

the cold weather comes, before they have regained their strength, they get pneumonia or consumption."

It is doubtless owing to the resulting tendency to respiratory diseases, coughs, "colds," bronchitis, pleurisy, pneumonia, that this combination of atmospheric humidity with low temperature exerts its chief influence as regards the spread of tuberculosis. It is a matter of constant occurrence for phthisis to supervene upon one of the above common respiratory diseases. Granted the presence of the tuberculosis virus, the diminished general and local power of resistance occasioned by these affections provide the conditions under which the more chronic disease may readily develop.

This evil influence of damp with cold is moreover greatly accentuated by the social customs which have grown up as a result of mistaken ideas as to how the effects of chill should be resisted. In the villages of the Punjab or the North-West Frontier Province it is not so much the actual cold which is accountable for the prevalence of tuberculosis as the mud-huts, impervious to air both as to walls and roof. Village dwellings in most other parts of India are built, whether by design or carelessness, with at least some possibility of ventilation. Here this possibility is carefully provided against.

Recent opinion in England emphasizes the importance of the prevalence of rain-bearing winds as being perhaps the single climatic element which has the most deleterious influence in regard to the treatment of tuberculosis. In India, most of the areas where such winds are prevalent have a warm and equable climate which may to some extent neutralize their effect. It is true, however, that the damp winds of the monsoon season in the Northern hill stations are commonly regarded as having an unfavourable influence upon the course of the disease.

We have seen that such influence as may be said to be exerted by climate upon the prevalence of tuberculosis, is mainly of an indirect character. For this reason, and also because of the absence of reliable statistics of the disease for rural areas, to serve as a basis of comparison, there seems to be little or no advantage in the introduction of detailed meteorological data in this general survey.

CHAPTER IV.

TUBERCULOSIS IN CITIES AND TOWNS.

We have now to consider those conditions in India which man has created for himself as distinguished from those which he found awaiting him. Tuberculosis is a social disease, dependent—in India at all events—almost entirely upon infection from man to man. It follows from this that social causes are far more important than climatic ones in estimating reasons for the local prevalence of the disease. As a matter of fact, in almost every part of India, the mortality from tuberculous diseases is very much higher in cities than in villages; it rises indeed almost exactly in proportion to the density of population in an area. Further in cities the closest correspondence has been observed between the number of families who severally occupy one room, two rooms or more than two, and the number of cases of phthisis amongst them.

In the case of the urban populations one was not so completely destitute of help from statistics as in the case of the country at large, and yet even so those cities are few and far between which possess any satisfactory system of verification of mortality, such as will entitle their vital returns to real confidence. Here again in making a comparison between various cities as regards the prevalence of tuberculosis within them, the main reliance had to be placed upon the personal impressions of those possessing local experience. In the course of my inquiry, however, every effort was made to test the opinions of those consulted as far as was possible. In the great majority of cases, workers spend the years of their service, and residents, their lives, at more than one centre. Hence, by following up the initial questions as to local prevalence by a request to carefully compare the conditions in the centre under inquiry with any others of which the informant had had experience, it was possible to obtain a mass of comparative

statements which was continually of use in correcting or confirming other information received.

It may be instructive to consider now a number of the principal Indian cities in order, mentioning any facts or details regarding them which are of interest in reference to our inquiry. The three Presidency cities present conditions which in many respects are unique ; their population is far less stationary than that of other towns and they are so extensive as to lessen to a large extent the value of dealing with them as single units. It may be admitted at once that the statistical returns of those cities where they are available fail to give any decided confirmation of the general opinion that consumption is greatly on the increase in them.

Statement shewing number of deaths from tuberculosis in Calcutta, Bombay, and Madras, 1904—1919.

Year.	Calcutta.		Bombay.		Madras	
	Deaths from T.	T. rate per mille.	Deaths from T.	T. rate per mille.	Deaths from T.	T. rate per mille.
1904 ...	1,608	1·8	3,548	4·57	348	0·6
1905 ...	2,052	2·4	3,183	4·10	832	1·6
1906 ...	2,201	2·6	4,052	4·14	736	1·4
1907 ...	2,241	2·6	3,440	3·51	641	1·2
1908 ...	2,101	2·5	3,023	3·09	747	1·4
1909 ...	1,949	2·3	2,862	2·92	774	1·4
1910 ...	1,971	2·3	2,839	2·90	459	0·9
1911 ...	2,060	2·3	2,694	2·75	760	1·5
1912 ...	1,931	2·3	2,794	2·85	672	1·3
1913 ...	2,196	2·5	2,152	2·19	481	0·9
1914 ...	2,137	2·4	1,889	1·92	738	1·4
1915 ...	1,920	2·1	1,710	1·74	759	1·5
1916 ...	1,738	1·9	1,902	1·94	876	1·7
1917 ...	1,539	1·7	2,118	2·16	1,067	2·1
1918 ...	1,826	2·0	2,513	2·56	1,488	2·9
1919 ...	1,889	2·1	2,780	2·83	1,309	2·5

Calcutta.—The tuberculosis death-rate here has remained almost stationary for many years past, the total deaths during 1919 being 1,889, giving a death-rate of 2.1 per mille. Here, however, as in the case of Bombay and Madras, the incidence of the disease is concentrated on central and greatly overcrowded areas where the tuberculosis death-rate probably rises to 4.0 or even higher. The extensive suburbs of the city are, comparatively speaking, free from the disease. In 1913 phthisis caused more deaths than either of the acute infectious diseases, although both plague and cholera were present in an epidemic form. Taking into consideration the large number of people—students, labourers and others—who return to their homes at a distance after having become infected with the disease in the city, it is impossible to avoid the conviction that the above figures fail to indicate the real mortality. Sir Leonard Rogers, as a result of a careful series of analysis of the post-mortem examinations made in connection with the Calcutta hospitals for a period of 22 years, found that no fewer than 17 per cent. of the total deaths had been due to tuberculous disease, while in 25 per cent. of the cases examined distinct signs of tuberculosis were found.

Bombay.—Here there has been during the past few years a steady increase in the number of deaths registered as due to tuberculosis. In 1919 the total number of deaths from the disease was 2,780, giving a tuberculosis death-rate of 2.83. From these figures it is probable that there may be approximately 10,000 persons suffering from the disease at any one time. Both from medical men practising in the city, and from health officers and others possessing intimate knowledge of some of the districts around, there is conclusive evidence to prove that the towns and village districts in communication with Bombay have their tuberculosis mortality seriously increased owing to the return of patients from the city to die in their own homes.

A careful analysis by myself of the post-mortem records at the Jamshedji Jijibhoy Hospital for 1914 showed that out of a total number of 157 cases examined, no fewer than 71 (*i.e.*, 45.2 per cent.) showed definite signs of tuberculosis, while in 56 of these, *i.e.*, 35.7 per

cent. of the whole, tuberculosis was noted as being the cause of death. Of the 56 fatal cases of tuberculosis, 40 were from pulmonary phthisis. *

Madras—With its population of 520,000, is without question, as regards prevalence of tuberculosis the most favourable of the three Presidency cities. It is natural that it should be so, since the city is spread over a very large area, and the most crowded parts show a density of only 132.6 persons per acre. In 1913 out of 20,675 deaths only 481 were reported as due to tuberculosis, giving a death-rate of .9. There has, however, been a steady increase in the number of tuberculosis deaths registered since that year, and in 1919 the total number of deaths was 1,309, giving a tuberculosis death-rate of 2.5. It is probable that most of this apparent increase may be due to a gradual improvement in the system of registration.

It is in the Bombay Presidency that during the past few years systematic attempts have been made to secure accurate registration of deaths from tuberculosis both in towns and rural districts. The following table, which is taken from the Annual Report for 1918 of the Sanitary Commissioner for the Government of Bombay, gives the phthisis death-rate for some of the chief towns in the Presidency:—

Towns.	T. Death-rate.	
	1918	1917
Ahmedabad	5.93	4.35
Broach	5.79	3.34
Kapadvanj	5.71	5.03

* In interpreting the above figures it is necessary to bear in mind the very special character of the population represented. It is impossible in India to perform post-mortem examinations without the consent of the relatives of the deceased, and this consent is almost invariably withheld. The great majority therefore of the cases here dealt with consist of friendless and homeless persons who had no relatives to arrange for their funerals or to withhold consent. This *caveat* may also be needed in reading the similar figures from Calcutta given above.

Towns.	T. Death-rate.	
	1918	1917
Surat	4.08	4.07
Dholka	3.72	3.58
Dhandhuka	3.36	2.49
Kaira	3.27	2.74
Ahmednagar	4.99	3.93
Poona	3.64	2.81
Satara	3.64	4.50
Kirkee	3.55	1.44
Ratnagiri	2.27	1.26
Ranebennur	4.30	2.10
Ilkal	3.22	2.44
Gokak	3.00	2.32
Belgaum	2.23	1.94
Alibag	3.57	4.47
Bhiwandi	2.93	2.78
Bandra	1.96	1.48
Thana	1.80	2.56
Erandol	1.37	2.43

Further analysis of the phthisis mortality shows a high excess of female as compared with male deaths amongst the Mohammedan population of towns of Guzerat. In Sind there were 595 deaths returned as phthisis, 91 per cent. of which were from Karachi and Hyderabad towns.

Ahmedabad.—The table given below shows the mortality from tuberculosis in this crowded city of 225,539 inhabitants.

In 1919 the tuberculosis death-rate reached 5.91, the highest figure officially recorded in India for any large city. The city lies low ; it has a water-supply but deficient drainage, parts of it being in consequence very damp. It is a large manufacturing centre, the labourers employed in the numerous mills living (as well as in many cases working) under most insanitary conditions. A careful verification and analysis of all deaths occurring during two months of 1916 gave 135 deaths from phthisis, of which 71 were male and 64 female; 95 were Hindus (55 m. and 40 f.); 33 Mohammedans (12 m. and 21 f.); and 7 Jains.

Year.	Total deaths.	Tuber-culosis deaths.	Total death-rate.	Tuber-culosis death-rate.
1911—12	9,092	917	40.31	4.06
1912—13	13,883	1,013	61.55	4.49
1913—14	8,477	997	37.58	4.42
1914—15	8,847	837	39.22	3.71
1915—16	11,007	991	48.80	4.39
1916—17	10,359	962	45.92	4.26
1917—18	16,318	1,022	72.35	4.53
1918—19	14,793	1,196	65.58	5.32
1919—20	11,143	1,335	49.40	5.91

Lucknow.—Population 235,000. Here the Health Officer undertook in 1913 a careful verification of the deaths occurring over a large area of the city. As a result of this it was found that out of a total of 1,236 deaths investigated, no fewer than 221 were due to tuberculosis, giving the high proportion of 17.8 per cent. of all

deaths. The total death-rate for 1913 was 46.98. Of these 221 cases the deaths of Hindus were almost equally divided between the sexes, there being 41 males and 49 females. Amongst the Mohammedans, however, the proportions were very different, the women being twice as numerous as the men (males 44, females 87).

In Lucknow, as also in Delhi, there are a considerable number of Mohammedans belonging to families which formerly influential, are now decadent. Many of these are living in circumstances of extreme poverty, while they continue to observe Purdah with strictness. By all accounts phthisis is very prevalent amongst them.

Lahore.—Population 210,271. Deaths from all causes (in 1913) 7,080, giving a general death-rate of 33.67. There was during this year careful verification of deaths reported. The number of deaths from phthisis was 630, *i.e.*, 8.89 per cent. of the total deaths, equivalent to a tuberculosis death-rate of 2.9 per mille. In 1916 the total number of tuberculosis deaths registered was 547 giving a rate of 2.6 per mille, while in 1917 the number was 584, *i.e.*, 2.7 per mille and 6.4 per cent. of the total deaths.

Amritsar.—Population 151,339. Total deaths during 1914, 7,407, giving a death-rate of 45.43. Of this, 614 were reported as due to phthisis, equivalent to a tuberculosis death-rate of 4.05. This high rate is in complete agreement with the impressions which a careful inspection of the city, together with a personal experience of several years of work there, have given me.

Nagpur.—Population 107,444. Here there was, in 1913, a total mortality of 4,130, including 603 deaths from respiratory diseases and 254 from tuberculosis ; this gives a tuberculosis death-rate of 2.3 per mille.

Delhi.—Population 225,471. Here, there has been no satisfactory system of verification of mortality and it is impossible to give a tuberculosis death-rate. The general death-rate is high, 43.74 per mille in 1913, and the best local opinion is unanimous as to the very great prevalence of tuberculosis, especially amongst the

Mussalman women. The Health Officer believes that a large proportion of the deaths from "respiratory diseases" (1,946 in 1913), were really due to phthisis. The distribution of these deaths throughout the city shewed a remarkable correspondence with the areas of greatest congestion. One crowded ward containing 7,941 inhabitants had 159 deaths from "respiratory diseases," while another less crowded but more extensive ward with a population of 42,270 had only 94 deaths, thus with a population nearly six times as great as the former ward, returning 65 deaths less.

In 1917-18 there were 240 deaths registered as due to phthisis, but this figure was regarded by the Health Officer as being far below the actual prevalence. This was clearly demonstrated by an experimental effort at verification of all deaths in a limited area of the city which was carried out during 4½ months. Out of 439 deaths, of which only 5 had been registered as due to phthisis, no less than 80 deaths were found to be from this cause, with an additional 10, attributable to other forms of tuberculosis. This gives the very high proportion of 20.5 per cent. of total deaths due to tubercle.

Meerut.—Population 116,227. Here for the past few years there has been an organized system of verification of all deaths reported. The 12 months period, November 1913 to November 1914, gives a total tuberculosis mortality of 234, equivalent to a death-rate of 3.05 per mille. It is interesting to note the consensus of local opinion that as regards prevalence of this disease, Meerut compares very favourably with both Delhi and Agra. This is entirely what a careful comparison of the more crowded parts of the three cities would lead one to expect.

Cawnpore.—Population 173,973. The death-rate for the year ending March 31st, 1914, was 52.76. Out of 7,321 deaths which occurred during the first 10 months of 1914, 904 were reported as due to tuberculosis, *i.e.*, 12.3 per cent. of the total. On the total death-rate just given this proportion would give a tuberculosis rate of 6.4 per mille. This may quite well be correct, since out of 2,000 deaths verified during the year ending March, 1912,

it was found that 16.73 per cent. were due to phthisis. The town is excessively congested, there being special local barriers (two of which are the River Ganges and the railway), which have hitherto limited its natural expansion. The authorities are alive to the danger, and extensive schemes for the enlargement of the city are under consideration.

Mysore—With a population of 71,306, shews the following returns :—

Year.	Total deaths.	Total death-rate.	Phthisis deaths.			Phthisis death-rate.
			Male.	Female.	Total.	
1909 ...	4,210	61·8	68	129	197	2·8
1910 ...	2,328	34·1	65	170	235	3·4
1911 ...	2,599	36·4	44	152	196	2·7
1912 ...	1,904	26·7	50	138	188	2·6
1913 ...	1,980	27·7	46	138	184	2·5

Karachi.—Here no very satisfactory statistical returns are available but by all accounts prevalence is considerable. There were in 1917, 269 deaths registered as due to phthisis, but this does not represent the true prevalence. The Medical Officer of Health reports:—"Many deaths from this disease escape detection, and are entered as bronchitis or asthma. There is every reason for believing that the disease is rapidly advancing in the city." The conditions are probably intermediate between those of Bombay and Madras.

Benares.—This city had a total mortality of 10,311 in 1914, representing a death-rate of 51.53. This figure is doubtless increased owing to the large number of Hindus who migrate to Benares in order to die there. Here again, however, no returns are obtainable and any statistics would have been to a large extent vitiated by the great fluctuations of the population. The city is evidently one of the very worst as regards phthisis, and I have been informed that tuberculous gland

affections, including tabes mesenterica, are very common amongst the small children. The prevalence being so great it can scarcely be doubted that Benares serves as a distributing centre for the disease, through the thousands of pilgrims who annually visit the city from all parts of India.

Peshawar.—Population 75,000; death-rate from all causes 26.0. Here also there are no official statistics available but a recently undertaken series of verifications of all deaths reported, gave the proportion of deaths from tuberculosis as being nearly 20 per cent. of the total mortality.

Salem.—Population 75,000. Amongst the 1,901 deaths which occurred during 1914, there were 78 deaths from tuberculosis. This gives a tuberculosis death-rate of 1.03 per mille, the deaths from phthisis forming 4.1 per cent. of the total mortality. This result is fairly typical of the more favourable cities of Southern India.

Patiala (Punjab).—Here out of a population of 46,974, there were in the year 1914-15, 98 deaths from phthisis, giving a tuberculosis death-rate of 2.08 per mille.

As regards the remaining cities visited during the course of my tour, including some of the most important in India, I have to frankly acknowledge that there is no accurate information available, nothing in fact beyond one's own personal impressions, founded, as has been explained, upon careful local inquiries coupled with personal inspection visits of the healthiest and the most insanitary quarters of each city, and upon the carefully collated opinions of those qualified to give them, as to the comparative prevalence of the disease in various towns throughout a given area.

To attempt to give statistics where none worthy of the name exist, would be to darken rather than to enlighten the problem. I therefore propose to submit a tentative grouping of various cities of India and Burma, in accordance with my estimate of the relative prevalence of tuberculosis in them. Such a comparison may at least arouse some local authorities to make the inquiries which alone could enable them to correct the estimate.

I am encouraged to take this course by the fact that in the case of those cities of which reliable statistics are available, the returns for tuberculosis coincided in almost every instance with what I had myself independently decided as to the probable degree of local prevalence.

In the first group I will place those towns in which the prevalence of tuberculosis can hardly be regarded as extreme or even very considerable. Such favourable towns could usually be judged as such upon one's first inspection visit. The general openness of the main bazaars, and specially the comparative absence of the real hot-bed areas of consumption, the narrow *galis*, alleys with many-storied crowded houses, whose fronts almost touch each other and whose windows are carefully economised so as to discourage curiosity; this, together with the preponderance of one and two-storied houses, prepared one for the belief that the town in question would have a tuberculosis death-rate of less than 2.0 per mille. Such towns were, almost in every case, not amongst the ancient ones of India.

In a middle group will come a number of cities in all of which the disease is extremely prevalent ; sufficiently so to be the cause of real anxiety to those with any close knowledge of local conditions. In these cities, while the average of crowding may perhaps not be very high, yet there are densely overcrowded quarters, and perhaps also special communities amongst whom phthisis is more than ordinarily frequent. Such will be cities with a death-rate varying from 2.0 to 3.0 per mille.

Lastly, there will come a group, all too numerous, of cities regarding which those who are closely acquainted with them agree in describing consumption as an excessively prevalent scourge.

In all the cities of this third class the tuberculosis death-rate is probably upwards of 3.0 per mille ; in some cases very decidedly above this figure. While the death-rates of some of the great cities such as Calcutta and Bombay, each taken as a whole, are lower than this, yet they each contain such large areas in which the prevalence is undeniably extreme as to warrant their inclusion in the list. It will be noted that these cities are for the most part ancient ; they all contain densely

crowded areas ; they are usually built of comparatively permanent materials ; they include some of the most renowned pilgrimage centres in the country, and many of them stand in low-lying districts of which the surface water is at a high level.

In the following list only those cities have been included which were actually visited by myself, and where careful inquiries elicited information sufficiently definite to justify the tentative classification. In most cases the verdict of the Medical Officers of Health was more severe than my own in estimating local prevalence. It need hardly be pointed out that the suburbs of even the most tuberculous city may often be almost absolutely free from the disease. A city whose tuberculosis death-rate is 3 per mille, will contain extensive areas in which it may be only 0.5, these being overbalanced, however, by other crowded areas where it may rise to 4, 4.5, or even 5 per mille.

CLASSIFICATION OF INDIAN CITIES

According to estimated prevalence of Tuberculosis.

Class I.	Class II.	Class III.
Death-rate less than 2.0 per mille.	Death-rate from 2.0 to 3.0 per mille.	Death-rate over 3.0 per mille.
Aligarh.	Ahmednagar.	Agra.
Allahabad.	Bangalore.	Ahmedabad.
Amraoti.	Bannu.	Ajmere.
Aurungabad.	Bareilly.	Amritsar.
Berhampur.	Bhagalpur.	Benares.
Cuttack.	Bharatpur.	Bhopal.
Ellore.	Gwalior.	Bombay.
Ferozepore.	Indore.	Broach.
Gorakhpore.	Jabbalpur.	Calcutta.
Jalna.	Jhansi.	Calicut.
Kohat.	Jodhpur.	Cawnpore.
Lyallpur.	Karachi.	Dacca.
Muttra.	Ludhiana.	Delhi.
Montgomery.	Moradabad.	Gaya.
Muzaffarpur.	Moulmein.	Hyderabad (Deccan).
Nainital.	Meerut.	Hyderabad (Sind).
Nowshera.	Mysore.	Jaipur.
Pakkoku.	Nagpur.	Lahore.
Ranchi.	Patiala.	Lucknow.
Rawalpindi.	Prome.	Madras.

CLASSIFICATION OF INDIAN CITIES—contd.

Class I.	Class II.	Class III.
Death-rate less than 2.0 per mille.	Death-rate from 2.0 to 3.0 per mille.	Death-rate over 3.0 per mille.
Sagaing.	Puri.	Madura.
Salem.	Secunderabad.	Mandalay.
Shillong.	Sialkote.	Multan.
Simla.	Tanjore.	Patna.
Tarn Taran.	Tinnevelly.	Peshawar.
Vellore.	Trichinopoly.	Poona.
Waltair.	Udaipur.	Rangoon.
Warangal.	Vizagapatam.	Srinagar.
Wardha.	Wazirabad.	Surat.

It must of course be noted that such a comparison as that here given possesses no authoritative value. It merely represents an individual estimate of prevalence. Inasmuch, however, as this estimate has been formed after careful inquiries made on the spot in the case of every one of the cities and towns concerned, it seems worth while to place it upon record. Any value which may attach to this classification, would extend also to its use as a rough means of estimating the approximate prevalence of tuberculosis in other towns not on the list, since those mentioned are sufficiently varied, whether as regards geographical position, or climatic conditions, or size, or in other respects to render them suitable for purposes of comparison with other similar towns throughout India and Burma.

There is one other source of information which is of real value as an indication of the extent to which consumption is spreading amongst the more educated of the town-dwellers of India, although to use it, as some have done, in order to form conclusions as to the prevalence throughout the country, seems altogether unjustifiable. I allude to the figures of the largest of the Indian Assurance Companies, the Oriental Government Security Life Assurance Company, Ltd., whose head offices are in Bombay.

The table given below is compiled from the Annual Reports of the Company for the eight years 1910-17, and shews (in the case of Hindus only) the numbers of claims paid on account of deaths from various diseases:—

Oriental Assurance Company.

Diseases.	NUMBER OF DEATH CLAIMS PAID.																Total claims.	Total per cent.
	1910.		1911.		1912.		1913.		1914.		1915.		1916.		1917.			
	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.		
Heart	57	10·1	53	9·7	49	8·4	60	10·2	82	12·8	54	8·2	51	8·1	59	9·3	465	9·7
Brain & nervous system ...	67	11·9	40	7·3	54	9·3	43	7·3	61	9·5	68	10·4	59	9·4	74	11·5	456	9·7
Fever	22	3·9	41	7·5	24	4·1	33	5·6	43	6·7	47	7·2	46	7·3	50	7·8	306	6·3
Enteric Fever ...	29	5·1	44	8·0	44	7·6	40	6·8	29	4·5	28	4·3	27	4·3	29	4·5	270	5·5
Plague ...	58	10·3	53	9·7	55	9·5	42	7·1	34	5·3	45	6·8	47	7·5	36	5·6	370	7·6
Small-pox ...	0	0·0	2	·3	0	0·0	2	0·3	3	·4	4	·6	3	·4	2	·3	16	0·3
Liver	22	3·9	10	1·8	16	2·7	18	3·1	17	2·6	18	2·7	32	5·1	19	2·9	152	3·1
Cholera ...	33	5·8	13	2·3	21	3·6	18	3·1	20	3·1	17	2·6	17	2·7	16	2·5	155	3·2
Diabetes & Carbuncle ...	43	7·6	49	8·9	57	9·8	53	9·0	55	8·6	51	7·8	57	9·1	55	8·6	420	8·7
Stomach & intestinal ...	39	6·9	52	9·5	60	10·3	61	10·4	72	11·2	77	11·8	76	12·1	72	11·1	509	10·3
Respiratory organs ...	55	9·7	48	8·7	58	10·0	65	11·0	72	11·2	83	12·7	72	11·3	67	10·5	520	10·7
Tubercle ...	51	9·0	56	10·2	71	12·2	76	12·9	54	8·4	43	6·6	42	6·7	37	5·8	430	8·8
Kidney ...	22	3·9	27	4·9	19	3·2	20	3·4	24	3·7	37	5·6	26	4·1	37	5·8	212	4·3
Debility & senile decay ...	17	3·0	20	3·6	14	2·4	13	2·2	25	3·9	28	4·3	23	3·6	27	4·2	167	3·4
All other causes ...	48	8·5	38	6·9	38	6·5	42	7·2	47	7·3	51	7·8	46	7·3	54	8·5	364	7·5
Total claims ...	563		546		580		586		638		651		624		634		4,822	

From the final column of the foregoing statement it will be seen that out of the whole series of claims paid during the eight years, in no less than 8.8 per cent. of the cases death was due to tubercle. The whole return may be taken as indicating with a very fair degree of accuracy the number of persons out of every hundred healthy educated young men who may ultimately be expected to die by reason of the various diseases mentioned. Thus out of every hundred insured persons, who died during the eight years, nearly nine lost their lives as a result of tuberculosis.

There are special reasons why the statements shown above may be regarded as worthy of careful consideration. They represent a very limited community ; those persons who insure their lives in India are almost invariably men, and men possessed not only of education but of a certain degree of property and social influence. Furthermore, the figures as regards the prevalence of tubercle as a cause of death do not in any way represent the total bulk of the disease in the community to which these insured persons belonged. Apart from those who may have died from tuberculosis in childhood, this statement takes no account of the women, the delicate ones, those already affected with the disease, or those threatened with it. All of these would either not think of insuring their lives or would be promptly eliminated, if they tried to do so, at the medical examination. The statement gives in fact *the number of educated men who, although at the time of early manhood they were found upon careful medical examination to be free from consumption, yet nevertheless in later years did succumb to it.*

The point up to which I have been leading is this : that here we may see the prospects of those educated Indians upon whom the responsibility for improving social conditions must of necessity to a large extent rest; and that the danger to which their attention is directed, and for the prevention of which their assistance will be claimed, is one which in a very real sense *relates to themselves*, not merely to some other less fortunate community.

Of these healthy leaders of society then, tuberculosis claims in the end nearly 9 per cent. as its own

victims, and yet these are the ones who ought to have the knowledge which in all probability would save them. See what education has done in the case of small-pox. Of this chosen class only sixteen deaths out of a total of 4,822, have occurred as a result of small-pox, the simple reason being that applicants for insurance who are not already protected by having had small-pox in their childhood, are not accepted unless they first protect themselves by efficient vaccination.

As a means of gaining any accurate idea of the prevalence of tuberculosis in cities, I am deliberately refraining from any attempt to exhibit returns of cases treated in hospitals, since I cannot but feel that the conclusions drawn from such returns would be almost valueless. There is no means of judging with any accuracy the relative proportions between those who attend hospitals for treatment and those who remain untreated, or depend upon their Indian "hakims" and "vaids." Further, sufferers from phthisis are at many of the best hospitals, in all but quite exceptional cases, refused admission on account of the infectious nature of the disease; while any increase which returns may shew in the proportional attendance of tuberculosis cases amongst out-patients, is undoubtedly explicable in the main, not by increased prevalence, but by greater care in making and recording diagnosis. It is not so much that individual doctors are improving in methods, as that the old generation of men for whom "cough and fever" was a sufficiently accurate diagnosis, has been, in the cities at least, largely replaced by men who are of a distinctly higher professional standard. It is not so many years since tubercle of the lung was differentiated as a disease to be entered separately in statistics, and it is natural that its recognition should follow gradually as knowledge and diagnostic methods develop.

Before leaving the subject of the prevalence of consumption in Indian cities it is necessary to lay emphasis upon the fact that the city prevalence is by no means limited to the city itself. Around every large town in India there is a fringe of consumption-prevalence which represents the amount to which the disease is spreading amongst the surrounding villages.

The width of this surrounding fringe and the depth of its shade will depend largely upon the prevalence in the central city. Where the local prevalence is great, the amount of intercourse between city and villages extensive, and the conditions in the villages favourable to the propagation of the disease when once it gains an entrance, the prevalence in the nearer villages may even come to approximate that in the parent city itself. Here it is that increase in the prevalence of tuberculosis has manifested itself most markedly during recent decades.

CHAPTER V.

TUBERCULOSIS AND THE INDIAN CHRISTIAN COMMUNITY.

The death-rate of the Indian Christian community is in most parts of India distinctly lower than that of the general population. This is perhaps not to be wondered at since the members of this community are far more directly than others under the influence of Western progress in medical and sanitary matters, and their conditions of life are probably on the whole more favourable. The very considerable prevalence of tuberculosis noticed amongst them in many centres is, therefore, all the more remarkable, especially since they are free from several of the social customs which have already been mentioned as being conducive to its spread.

The fact that this community is of comparatively recent development, and the facility which is afforded to the study of the conditions among its members, lends additional interest to the problem of the causation of the exceptional prevalence of phthisis in its midst. In most centres where there has been a well-established Christian mission, there is a cemetery at which all Christian burials take place, and of which the register is carefully kept under the supervision of one of the missionaries. In this register the cause of the death is in almost all cases clearly entered, the diagnosis being founded, if not on definite medical opinion, at least on the personal knowledge of the missionary who makes the entry. This leaves a comparatively very small margin of error in the vital statistics of the Christian community.

In the following tables, which give the returns of certain of these burial registers, the death-rates per mille have not been given, partly because of the difficulty in obtaining an accurate record of the populations at successive periods represented by the various returns, and partly because the value of the death-rate is in this case somewhat discounted by the large proportion of immigrant members as compared with that amongst the general population of a city. A far clearer record both of the comparative prevalence of tuberculosis

amongst the community, as also of its increase or decrease, will be afforded by the return which is given in each case of the proportional number of deaths from tuberculosis as compared with those from all other diseases. The final column in each case shows the very high proportion which tuberculosis bears to other diseases as a cause of death in *adult* life, *i.e.*, from the ages of 15—55 years.

The most noteworthy fact which emerges from these tables is that in almost every case, the proportional mortality from tuberculosis, as compared with that from all causes, has remained stationary. This must mean that, contrary to the views of very many, consumption, instead of increasing in this community, is definitely on the decrease. That the general mortality has improved of recent years, is an undoubted fact, and for the tuberculosis proportion to have remained constant, proves a corresponding decrease in its prevalence.

This satisfactory fact is the natural outcome of much anxious consideration which has been devoted to the matter during recent years both by those responsible for general missionary policy and those connected with institutions. In the section on Prevention (see Chapter XVII), it will be seen how vigorously various of the Missionary bodies have bestirred themselves in order to provide sanatorium treatment for consumptive members of the community.

BURIAL REGISTER RETURNS.

Indian Christians, Calcutta.

Year.	Total deaths.	Tuberculosis Deaths.			Tuberculosis per cent. of total deaths.	Total deaths 15—55 years.	Tuberculosis deaths 15—55 years.	Tuberculosis per cent. of deaths 15—55 years.
		Male.	Female.	Total.				
1885 ...	103	7	3	10	9·7	42	8	19·0
1890 ...	118	5	5	10	8·4	41	8	19·5
1895 ...	200	17	11	28	14·0	88	20	22·7
1900 ...	350	16	11	27	7·7	146	23	15·7
1905 ...	320	15	17	32	10·0	144	27	18·7
1910 ...	336	18	17	35	10·4	125	31	24·8
1914 ...	306	22	11	33	10·7	144	29	20·1
Total ...	1,733	100	75	175	10·1	730	146	20·0

The above return, giving the annual mortality from tuberculosis and other diseases at five-yearly intervals, covers a period of 30 years. The most noteworthy fact regarding it is that within this comparatively lengthened period, the proportion which tuberculosis bears to other diseases as a cause of death has not shown any marked increase.

Taking 11,412 as the Indian Christian population of Calcutta, the above return for 1914 gives a total death-rate of 28. 4 per mille, and a tuberculosis rate of 3.3, which latter approximates somewhat closely to that amongst the general population of those parts of the city where they mostly reside.

The following return gives a similar record regarding the prevalence of tuberculosis amongst the European and Anglo-Indian population in Calcutta, also for a period of 30 years :—

BURIAL REGISTER RETURNS.

Europeans and Anglo-Indians, Calcutta.

Year.	Total deaths.	Tuberculosis Deaths.			Tuberculosis per cent. of total deaths.	Total deaths 15—55 years.	Tuberculosis deaths 15—55 years.	Tuberculosis per cent. of deaths 15—55 years.
		Male.	Female.	Total.				
1885 ...	473	14	17	31	6·5	226	30	13·2
1890 ...	452	19	19	38	8·4	209	28	13·4
1895 ...	648	30	32	62	9·5	259	46	17·7
1900 ...	629	27	27	54	8·6	267	43	16·1
1905 ...	612	23	32	55	8·9	248	47	18·9
1910 ...	535	23	21	44	8·2	205	31	15·1
1914 ...	603	25	32	57	9·4	240	43	17·9
Total ..	3,952	161	180	341	8·6	1,654	268	16·2

From this return the same fact is evident as in the preceding one, namely, that the proportional prevalence

of tuberculosis during the period has been almost stationary; the figures are distinctly lower than those in the case of Indian Christians.

The next return deals with the Christian community at Calicut on the Malabar Coast, where the prevalence from tuberculosis is by general consent higher than in almost any part of South India.

BURIAL REGISTER RETURNS.

Basel Evangelical Mission, Calicut.

Year.	Total deaths.	Tuberculosis Deaths.			Tuberculosis per cent. of total deaths.	Total deaths 15—55 years.	Tuberculosis deaths 15—55 years.	Tuberculosis per cent. of deaths 15—55 years.
		Male.	Female.	Total.				
1905 ...	80	5	4	9	11·25	26	9	34·6
1906 ...	68	1	2	3	3·4	31	3	9·6
1907 ...	60	3	1	4	6·6	21	4	19·0
1908 ...	97	6	1	7	7·2	43	7	16·3
1909 ...	53	2	3	5	9·4	20	4	20·0
1910 ...	66	5	8	13	19·7	32	13	40·6
1911 ...	34	3	5	8	23·5	15	7	46·6
1912 ...	50	2	3	5	10·0	20	5	25·0
1913 ...	68	3	3	6	8·8	28	6	21·4
1914 ...	60	2	6	8	13·3	24	7	29·1
Total ..	656	32	36	68	10·3	260	65	25·0

Here it will be noticed that the proportional prevalence of tuberculosis is on the average almost exactly the same as that given above for the Indian Christian population at Calcutta. The period under observation is only 10 years, so it is difficult to say anything very definite regarding variations in prevalence, but there is a distinct tendency towards increase. The proportion

of adult deaths here is higher, a considerable number of cases being amongst those employed in the weaving industries.

The strength of the Calicut Christian community at the time of my visit was 1,940, giving a death-rate of 30.9 and a tuberculosis rate of 4.1 per mille. Of the total of 68 deaths from tubercle, only 7 were cases of surgical tuberculosis, 2 glandular, and 5 abdominal.*

Coming now to the Punjab we find a higher degree of proportional prevalence of the disease, although even here the figures do not shew any steady or regular increase.

BURIAL REGISTER RETURNS.

Indian Christians, Lahore.

Year.	Total deaths.	Tuberculosis Deaths.			Tuberculosis per cent. of total deaths.	Total deaths 15–55 years.	Tuberculosis deaths 15–55 years.	Tuberculosis per cent. of deaths 15–55 years.
		Male.	Female.	Total.				
1905 ...	44	3	5	8	18·2	15	5	33·3
1906 ...	20	1	1	2	10·0	9	2	22·2
1907 ...	35	...	4	4	11·4	14	4	28·5
1908 ...	48	8	1	9	18·7	21	9	42·8
1909 ...	27	2	4	6	22·2	11	6	54·5
1910 ...	23	2	1	3	13·0	9	2	22·2
1911 ...	31	4	2	6	19·3	16	6	37·5
1914(6months)	21	3	3	6	28·5	11	6	54·5
Total ..	249	23	21	44	17·6	106	40	37·7

Here in the most recent series, 1914, tuberculosis claims not less than 28.5 per cent. of the total mortality,

*Note.—Readers may be interested to know that in one Church register I found the entry "kranik" as a not infrequent cause of death. "Chronic bronchitis" had doubtless been the verdict given by the doctor.

while more than half of the total adult deaths are due to the same cause.

Agra is another centre where the tuberculosis prevalence is known to be high. The figures below are the returns for 28 years in the case of Agra, and for 21 years in the case of a Christian settlement at the village of Sikandra, about four miles away from the City.

INDIAN CHRISTIANS, AGRA.

28 *years, from* 1888—1915.

Period.	Total deaths.	Tuberculosis Deaths.			Tuberculosis per cent. of total deaths.	Total deaths 15—55 years.	Tuberculosis deaths 15—55 years.	Tuberculosis per cent. of deaths 15—56 years.
		Male.	Female.	Total.				
1888—1915 ...	365	41	40	81	22·2	171	69	40·3

INDIAN CHRISTIANS, SIKANDRA, AGRA.

21 *years, from* 1895—1915.

Period.	Total deaths.	Tuberculosis Deaths.			Tuberculosis per cent. of total deaths.	Total deaths 15–55 years.	Tuberculosis deaths 15—55 years.	Tuberculosis per cent. of deaths 15—55 years.
		Male.	Female.	Total.				
1895—1915 ...	277	40	42	82	29·6	106	50	47·2

In both these cases it will be noted that the tuberculosis percentage of all deaths, and especially of those in adult life, is extraordinarily high. The importance of the Sikandra return is accentuated by the fact that an important orphanage is situated here, and a considerable proportion of the cases of tuberculosis in the past have been from amongst its inmates. It is only fair to add that conditions here have improved greatly of recent years.

The final record is that from Amritsar, where the mortality from tuberculosis has been notoriously high.

BURIAL REGISTER RETURNS.

Indian Christians, Amritsar.

Quinquennial Periods.	Population.	Total deaths.	Tuberculosis Deaths.			Tuberculosis per cent. of total deaths.	Total deaths 15—55 years.	Tuberculosis deaths 15—55 years.	Tuberculosis per cent. of deaths 15—55 years.
			Male.	Female.	Total.				
1889—1893 ...	350	81	3	16	19	23·4	46	15	32·6
1894—1898 ...	368	85	10	20	30	35·3	52	22	42·3
1899—1903 ...	395	130	15	36	51	39·2	72	33	45·8
1904—1908 ...	408	119	12	27	39	32·8	60	32	53·3
1909—1913 ...	461	58	5	5	10	17·2	34	10	29·4
1914 ...	682	10	...	3	3	30·0	8	2	25·0
Total ..	...	483	45	107	152	31·4	272	114	41·9

The excessively high tuberculosis mortality during the 15 years 1894-1908 is the record of the great prevalence amongst Christian patients in a zenana hospital occupying Indian quarters in the city. A considerable proportion of these cases were sent from other centres, so that the return from these years is not a true picture of the local prevalence. The hospital in question became overcrowded and insanitary and it was closed about 1908. From this as from the other returns it will be seen what a large proportion of the adult deaths were due to tuberculosis.

Certain of the causes of the prevalence of consumption amongst Indian Christians will be found somewhat fully discussed in the chapter upon "Educational Institutions." Since the conditions especially associated with the spread of tuberculosis in boarding schools were regarded *as normal* 30 or 40 years ago, and since at that time boarding institutions were for the most part in the hands of Christian missionaries and designed for the education of Christian children, it was an inevitable consequence that in many cases the disease appeared amongst these children, and extended to the homes to which they

belonged. Furthermore, children who, when they reached the termination of their school career, were either predisposed to the disease or even perhaps already infected with it, would be not unlikely to manifest it in an active form after marriage. This has been especially the case with regard to children brought up in orphanages, particularly in those established in connection with the great famines. Whatever views we may hold regarding the causes underlying the prevalence of tuberculous affections amongst "famine orphans" during their subsequent school life, the fact of this prevalence is undoubted and there are numerous school records which show how many of these famine orphans have fallen victims to phthisis in after-life.

It seems indeed to be a rule—to which of course there are exceptions—that the centres where by general consent tuberculosis is most rife amongst the Christian community, are the centres where there have been long-established orphanages and schools for the poorer class of Christian children. In one large city there was good reason to believe that present prevalence of consumption might be directly traceable to the years succeeding the great famine of 1901, when into an existing boarding school there was a sudden influx of famine orphans, without adequate provision being made for increased accommodation or improvement in ventilation. Cases of consumption occurred amongst the orphans, and the infection inevitably spread amongst the other children of the school, with whom they mixed at meals and work.

The disease has obtained an entry into very many Christian homes, and in a large number of schools where the conditions are all that can be desired, the authorities state that such cases of consumption as do occur from time to time are in almost every case the result of infection contracted at the homes of the scholars. In one school where all the girls are weighed before and after the long vacation, it was found that the great majority lost weight, some quite markedly so, while at their homes.

There is no doubt that there are conditions obtaining in the homes of many Indian Christians which tend to predispose the members of their families towards consumption. It is not very easy to define these

conditions with exactness. For some of them a share of responsibility must, I believe, rest upon missionary leaders, amongst whom *in the past* the idea has been all too common that the methods of the West, its clothing, its food, and its customs, necessarily indicated a higher degree of civilisation and were generally more desirable than those of the East. There is reason to believe that much of the ill-health amongst Indian Christians is due to the attempt to imitate in an unwise and partial way Western customs as regards food and clothing.

Although missionaries have for the most part long ago seen the mistake of attempting to Anglicise their followers, and now use their utmost efforts to persuade them to remain loyal to the best of Eastern ways, yet the fashion has been set, and the ambition of many young parents is to copy English ways as far as their means will permit. The danger of this is that such imitation is almost of necessity superficial. Western habits of dress and food are on the whole framed upon a scale of expenditure far higher than that obtaining in India, and as a consequence that which is on the surface is copied, while the more essential but less obvious tends to be sacrificed. Thus we find money being spent upon tea, cakes, and biscuits, which ought to be used for the purchase of more nourishing food; and still more, thin pretty materials for dress being chosen to the exclusion of warm under-clothing or substantial but less showy stuffs.

The principles regarding change of environment, upon which emphasis has already been laid, need to be borne in mind in the home no less than in institutions, and it is a risky procedure, especially with children, to attempt to change in any radical way the usage as regards diet and clothing which experience may have shown to be well adapted to the needs of a country or race. If Indian Christians would select for imitation those traits and characteristics of the West which are universally advantageous, such as the love of fresh air and of physical exercise, they would not only be gaining health and strength for themselves but would be setting an example of the greatest value to their fellow-countrymen.

In the Christian community there is in most centres a slight but only slight preponderance of women amongst

those who are attacked by phthisis. The recent inquiry has shown me, which I had not previously recognised, that a large proportion of these women sufferers show their first manifestation of the disease very shortly after child-birth. I had thought that Christian women had progressed beyond the ignorance which will later on be described as causing such serious mortality amongst the women of other communities, but several very experienced authorities have assured me that the practices common in connection with child-birth amongst the *poorer* Christians were in many places not greatly different from those amongst the Hindus or Muhammadans around them; that there was often the same carelessness as regards cleanliness and the same actual dread of fresh air, whilst too often the withholding of milk or other nourishing food at such times, deprives the mother of what for her own sake and that of her child she most sorely needs. With increasing confidence in the numerous mission hospitals for women which are doing such excellent work, and the consequent increasing number of Christian women who, at the earnest invitation of those in charge, attend these institutions at the time of their confinements, it may well be hoped that this reproach may speedily be removed and that Christian women generally may be the means of spreading knowledge amongst others regarding this vitally important matter.

For all connected with the administration of missionary societies and their institutions, the importance of not unnecessarily bringing village folk, especially children, into city surroundings is a principle which should always be carefully borne in mind. When, whether for work, study, or training, it becomes necessary to do so, then the transfer should be made with a clear realization of the risk involved. This knowledge, that a boy or girl bred in the country is *ipso facto* more susceptible to tuberculosis, should call imperatively for special precautions in the direction of nourishing diet, open-air regime, and the avoidance of infection.

The need for such precautions is especially great in the case of those engaged in hospital work, and I have heard of many sad instances of nurses and assistants who have succumbed to rapid phthisis after having been brought from villages to work in city medical missions.

I myself know of two boys who after working as hospital dressers have contracted consumption during the past year, and in some city zenana hospitals the experience of similar disasters has compelled those in charge to decline altogether to admit cases of phthisis into their wards.

The number of foreign missionaries, who have themselves fallen victims to tuberculosis in one form or another, is by no means small ; two or three most valued medical workers in South India have contracted the disease during the past few years, while all over the country many of those engaged in schools and orphanages, and those whose work takes them continually into zenanas have suffered in the same way.

The various Roman Catholic sisterhoods in India have been heavy losers through tuberculosis. The self-sacrificing devotion of some of their members has seemed at times to blind them to the duty of taking precautions, while in several instances where rapid phthisis has supervened within a few months of the arrival of a nun into the country, there has seemed all too much reason to believe that infection had actually occurred before leaving home. It cannot be too strongly urged that when workers come out whose family history or physical characteristics suggest the possibility of their being affected by or predisposed to the disease, their location and sphere should be such as may afford a minimal amount of additional risk in this respect.

On the other hand I have heard of not a few missionaries, who after having suffered at home from incipient phthisis, have lived long and useful lives when engaged in district work in dry and healthy parts of India. Useless self-sacrifice is not heroism and when it is remembered that in taking measures to diminish dust, to increase the supply of fresh air, and to generally improve the conditions under which work is carried on, one is benefitting others no less than oneself, there need surely be no hesitation in adopting such precautions.

The Anglo-Indian Community.—Be the causes what they may, the general physical characteristics of this community are not those that are favourable as regards resistance to tuberculosis. In the case of the higher class amongst them, they approximate in habits as well as in

health to the Europeans around them, but to those who are poor, what has already been said regarding the tendency amongst Indian Christians to a partial imitation of Western ways applies with special force. Prevented by pride from enjoying the good things of the one race, and by poverty from enjoying those of the other, their homes in some of the great cities show a squalor which recalls the worst slum dwellings of London.

In Madras I visited one house of five rooms, each about 8 feet by 9 feet; in these there were four separate families and amongst them were two cases of advanced phthisis, both bed-ridden, and one child with suppurating tuberculous glands. I saw many similar dwellings at Calcutta also occupied by Anglo-Indians, of which the conditions were such as to defy any efforts which might be made to prevent infection.

The members of the missionary body have shewn with such transparent clearness their earnest and unanimous desire to improve the health conditions of those for whom they are responsible, that I have little fear that what has been said here and elsewhere by way of criticism will be misunderstood or resented. Every day is seeing the advent and wider dissemination of better methods; fearlessness in the frank recognition of mistakes is the first essential towards progress, the two are inseparable. I am not indeed without hopes that the frankness with which I have dealt with matters where every personal instinct would have urged me to paint conditions in favourable colours, may lend some added weight to what I may venture to say later on regarding other communities.

It would be unfair to describe the prevalence of tuberculosis amongst Indian Christians, without making thankful mention of the strong tendencies which during recent years have been setting in towards the improvement of their physical health. The keen interest which educational missionaries of to-day are taking in outdoor exercises, and all that makes for healthy living, and especially also, the work inaugurated by physical experts connected with the Young Men's Christian Association, are full of promise for the future.

CHAPTER VI.

IMMUNITY AND SUSCEPTIBILITY.

There are certain views in relation to the general epidemiology of tuberculosis which have been gradually gaining ground of recent years, and which are not only in many respects opposed to the opinions previously held, but may have a profound and vital influence upon practical measures for prevention in the future. Since in this country we are in the unique position for facing the problem of prevention practically *de novo*, it is of special importance that we should do so, guided by all that recent thought can tell us regarding the natural processes concerned in the spread of the disease. Further it will be found that in not a few instances Indian experience affords valuable confirmation of what has been already established in the case of other countries and races.

The view formerly held was that tuberculosis presented a typical instance of true heredity in disease; that the frequently observed tendency for it to "run in families," and to attack children of phthisical parents, was the expression of a genuine hereditary transmission of the disease itself. Gradually this opinion was modified, since it was found that children of consumptive parents, if carefully protected from tuberculous infection, did not contract the disease, and the widely current view to-day would explain the frequency of consumption in the children of tuberculous parents as being the result partly of the ever-present infection in the homes of such parents, and partly of a hereditary *predisposition*, it being recognized that no true infection is transmissible.

When we consider, however, the excessively unfavourable conditions as regards young children born and brought up in the homes of consumptive parents in city slums, the problem calling for explanation is not so much, why do so many contract tuberculosis, but rather *why do so many escape?* The attempt to explain this question

compels us to recognize the possibility of there being inherited protection or immunity.

Turning now from the individual to the race, it was formerly thought that those races which dwelt in the hills or the open country were less prone to the disease than the dwellers in cities and that the city populations become more and more predisposed to it in the course of time. The present view is that the very reverse is the truth. All recent epidemiological inquiry seems to establish without doubt the fact that the virgin races of mankind are specially susceptible to tuberculosis; in other words, that their powers of resistance to the disease have not as yet been developed owing to the absence of the hostile organism itself.

Instances of the comparatively high susceptibility of races which have not been previously exposed to infection, abound from all quarters of the globe. The practical extinction of many of the great races at their contact with modern civilization, as in the case of the Red Indians of North America, the Maoris of New Zealand, and the inhabitants of Polynesian Islands, such as Tahiti and the Hawaiian Islands, has been largely the result of tuberculosis; while the aboriginal inhabitants of Australia as well as of Southern and Central Africa have shown a like vulnerability to the disease.

Similar hyper-susceptibility has been shown by Irish emigrants to the crowded cities of the United States from country districts in Ireland, or by Italians from Calabria or Sicily as distinguished from those coming from the more infected districts of Lombardy or Tuscany (Sanarelli).* More recently precisely the same conditions have been described by Metchnikoff regarding the Kalmuk nomads inhabiting the Steppes in the neighbourhood of the Volga River and the Caspian Sea. Young men from these tribes sent by the Russian Government for their education to Astrakhan or other cities were found to contract phthisis with great readiness, returning in numerous cases to die in their own country.

* "Tuberculosi ed Evoluzione Sociale," 1913. A full abstract of this book is given in "La Presse Medicale" for April 25th, 1914.

"Among sixteen young Kalmuks who had just arrived at Astrakhan in 1911, eight, that is to say, one-half, did not give any reaction to tuberculin; they had not been infected in their native Steppes. Whilst among thirty-seven others who had been studying in Astrakhan, having remained there for more than a year, only one—a boy of fourteen years—failed to show the reaction. It results from this observation that infection by the bacillus of Koch is effected in the greater number of individuals during the first year of the contact of the inhabitants of the Steppes with those of the cities." *

Major S. L. Cummins, R.A.M.C., in an interesting paper on "Primitive Tribes and Tuberculosis" read before the Society of Tropical Medicine and Hygiene, has described a similar hyper-susceptibility on the part of the Sudanese soldiers in the Egyptian Army as compared with those of Egyptian origin. Major Cummins expresses in the following terms the conclusions which he reaches as a result of his observations:—

"1. That primitive tribes are highly susceptible to tuberculosis because, in the absence of the tubercle bacillus, they have never been obliged to protect themselves against that organism.

2. That civilized peoples are highly protected against tuberculosis because they have, in contact with the tubercle bacillus, elaborated protective substances against that organism." †

As instances of the second of these propositions, Sanarelli mentions the cases of the comparative immunity of the Jews, whom he calls the most urban population in the world, and also the remarkable fall in tuberculosis mortality observed in England about the middle of last century, and which he says not only preceded any great anti-tuberculosis efforts, but was most marked in days before general sanitary reform had made much progress. Metchnikoff also instances the cases of London, Boston (United States of America), Copenhagen and Hamburg as cities which have shown great diminution in

* "The Warfare against Tuberculosis," Metchnikoff, 1913.

† "Transactions of the Society of Tropical Medicine and Hygiene," Volume vii, No. 7, June, 1912.

To line 12, add footnote:—

Now Col. S. Lyle Cummins, C.B., C.M.G., Professor of Tuberculosis, Welsh National Medical School, University College, Cardiff.

tuberculosis death-rate, whereas other cities where hygienic measures have been no less energetic have shown an even upward tendency.

Turning again to the individual, the older observers noticed the comparative frequency of consumption in the families of phthisical patients and explained it by the theory of hereditary transmission of the disease. Later observers noticing how rapidly people brought in from an uninfected region contract consumption when brought into a tuberculous environment, and wondering why the families of the consumptives are not completely wiped out, explained the escape of the many survivors by the theory that the children of tuberculous parents inherit a certain degree of special immunity to the specific organism.

This does not conflict with the view that there may be a hereditary *predisposition* of a different sort, a predisposition which will be referred to again and again in the course of this book, an inherited poor physique, a mental attitude towards life tending in the direction of a sedentary occupation, other characteristics which might directly or indirectly make the individual more prone to succumb to infection. But in the presence of these factors and of the ever-present infection in the home of a careless consumptive, there is the one saving clause which may turn the scale, the fact that this particular bacillus finds in the offspring of a phthisical man or woman, an *uncongenial host*.

What now happens? Does the child escape infection altogether? By no means; the extraordinarily high percentage in infected cities (rising to even 80 per cent. or 90 per cent.) of children who after the age of from 8 to 12 years are found to react to the von Pirquet tuberculin test seems to prove conclusively that practically all such are attacked by the disease. One of two results follows. On the one hand the special power of resistance to the tubercle bacillus which the child has inherited may be sufficient to turn the scale in his favour, to determine that the result of the ever-present infection in his case shall be not an acute or progressive attack, but one of a sub-acute or chronic character, with which the protective mechanism of the body, white

corpuscles, lymphatic glands, etc., are able to deal. The alternative case is when, in spite of a specific power of resistance, the hostile elements are too strong ; the dose of virus too concentrated for this resistance to be effective. With an environment wholly unfavourable and physique naturally unhealthy ; still more if the protective forces are weakened by starvation or some intercurrent illness, the infection gains the day, and the child falls a victim either to acute tuberculosis (usually of brain, lung or abdomen), or else to chronic but progressive disease.

Often indeed the issue may for a time be in doubt, and then it is that a change of environment, a move from city to village surroundings, or even the supply of good food and care, may so reinforce the defences that victory may result. The important point to realise is that in the event of a favourable issue in any individual case, the patient is in the position not of a tuberculous subject with latent infection waiting at any moment to become active, but of *one who has passed through a mild attack of an infectious disease and is therefore henceforth protected against it.* As with most other infectious diseases a subsequent new attack may occur, as a result of some special exposure, but in comparison with others and specially in comparison with untainted ones from virgin districts, such individuals are far more likely to escape tuberculosis throughout the remainder of their lives.

The scars of the original encounter remain, either in the form of small hard glands in the neck, once active and enlarged, or possibly the literal scars whence tuberculous glands have been removed by operation. In many cases, however, the only signs that the subject has ever been exposed to tuberculous infection are to be found after death in the shape of scars of intestinal tuberculous ulcers, of old inactive mesenteric glands or small fibrous nodules in the lungs.

The question as to how far this immunity is inherited, and how far acquired in childhood, is one which it is difficult to answer with any degree of certainty. The tendency of present medical opinion is to place more reliance upon the protection which is acquired as a result

of repeated non-lethal doses, and to depend less upon what may be supposed to be transmitted by inheritance. This belief would seem to be borne out by recent vital statistics, according to which it appears that, although the great bulk of the mortality from tuberculosis falls during middle life, yet it is more fatal during infancy, (after the first six months of life), than at any subsequent short period.

The disease up to the end of the third year, tends to be of an acute and fatal character, the commonest types seen being tuberculous meningitis, tuberculous peritonitis, and acute general tuberculosis. After the third year, the mortality from tuberculosis rapidly declines, the infection causing lesions of a more chronic nature, such as glandular tuberculosis, or bone or joint disease, which frequently end in resolution and cure with the apparent ultimate result, as above explained, of protective immunity from future attacks.* These facts have an important bearing upon preventive measures directed towards the protection of children from tuberculosis. (*See* page 85.)

It has been clearly established—partly by inoculation experiments on animals, and partly by observing the effects of tuberculous infections from bovine sources (to which human beings are naturally resistant)—that when the infection is weak in comparison with the resisting power, the disease tends to become localised, mainly in the lymphatic glands and to a less extent in joints, bones and other centres. This is precisely what is found in the children in the worst slum areas of badly infected cities, the one outstanding fact from the point of view of tuberculosis being the extraordinarily high percentage of cases of tuberculous glands found amongst them. We shall have occasion to refer to this again.

A certain parallelism to this is seen in the case of plague. It is a common observation that the cases which recover are for the most part those in which buboes have formed at an early stage in the disease, or in other words, those in which the infection has not been strong enough to involve the whole system at once,

* See Cobbett, *op. cit.*, pp. 3-6.

but has become localised in the lymphatic glands. It would seem to be literally true, in many cases both of plague and of tubercle, that when the lymphatic glands are able to capture and imprison the bacilli, the position is saved. In both cases the resulting local inflammation of the gland may be sub-acute, resulting in absorption later on, or it may pass on to suppuration, when the contents are expelled, either naturally, by the bursting of the abscess, or by surgical operation.

If we may attempt to generalize on Nature's great anti-tuberculosis campaign, the process would seem to be somewhat as follows:—

When the population of a hitherto "virgin area" begins to aggregate into towns, becomes more or less "urbanized," then sooner or later tuberculous infection will inevitably appear. If the change of environment is comparatively rapid and universal, and especially if, along with new conditions of life, other unfavourable elements are present, such as alcoholism and venereal disease, the result may be the practical destruction of the population concerned. This is what we have seen in the case of various aboriginal tribes after exposure for a few decades to invasion by "Western civilisation" at its worst.

If on the other hand the urbanization is slow, the gradual development of towns taking place in the course of centuries amongst a large population, then Nature makes her response in resistance, and this would seem to take place by two separate processes both tending towards the freeing of the race from tuberculosis, but attaining the end in very different ways. The first is the gradual development amongst the race or community of a hereditary increase of resistance to the disease, shewn by a tendency to chronic and localised manifestations, which nevertheless are protective against future infection of the individual. In the case of family groups which are unable to respond to this means of protection the second alternative process comes into play, and that is the stern one of elimination. The very characteristics alluded to already as predisposing to the disease are themselves transmitted, and the family tends to die out. Man's co-operation with Nature in

the former process lies along the lines of sanitary progress and education; in the latter along those of eugenics.

I venture to quote what appears to me to be a very suggestive corroboration of the above from the point of view of the practical physician. It is from a lecture given by Dr. Thomas Beattie on "Points in the early diagnosis of Pulmonary Tuberculosis":—

> I would emphasize the value or otherwise of family history. When you have discovered signs of pulmonary tuberculosis you are familiar with the constant cry and pleading that there is no history of any such condition in the family. Let me assess the value of that for you. A family history of tuberculosis which has involved several members of a family, and in a large proportion of those involved there has been constant retrogression, and finally, fatal termination—that is a bad family history, indicating that the soil in that family is fertile for the growth of tubercle. A family history in which there is much tubercle—pulmonary, glandular, articular—but in which the majority of the cases have recovered and are still well after many years—that is a good family history, showing that the soil in that family is not fertile for the growth of tubercle. Where there is no family history of tubercle that history is usually bad. It is certainly exceedingly doubtful at best. It is virgin soil which has never been sown and is more apt to prove fertile than not. Such is the Arab coming from the desert into the city, and succumbing rapidly to tubercle when once infected with it."*

Those who have followed out these processes most carefully have drawn attention to the wonderful way in which the West of Europe has been cleansed from leprosy, apparently as a result of the gradual immunization of the whole population. In Paris, which in the middle ages was a hotbed of leprosy, not only is the disease now absent, but the inhabitants are practically proof against infection, cases of leprosy from abroad

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* "British Medical Journal," January 24th, 1920.

being admitted into the general wards of hospitals without the slightest fear of spreading the disease. The history of leprosy in Europe, its wide diffusion, followed in the lapse of centuries by its complete disappearance, is believed by some to present a parallel to the preventive processes which are going on before us to-day in regard to tuberculosis.

So Nature is carrying on in her own slow way her great anti-tuberculosis campaign, gradually making use of suffering to work out ultimate good in the purification from disease of those most exposed to it.

The result of my inquiries throughout India has been to afford confirmation in many directions of the views enunciated above, as well as to indicate the importance of further inquiry. There are regions where the disease has practically not yet gained an entrance among the people, such as Chitral, Gilgit and some of the hill districts inhabited by aboriginal tribes. In the case of many of the latter their great susceptibility to tuberculosis has been repeatedly proved when individuals have emigrated as students or labourers to infected areas. The susceptibility of Gurkhas has been recognized for many years and has been a frequent cause of anxiety to Army Authorities in India.

As regards Pathans, the readiness with which they fall victims to consumption when coming from their frontier hills to live in Peshawar or other border cities, has been a matter of my own personal observation for many years past, and striking illustration of the same fact is afforded by the case of Pathan convicts imprisoned in Central Punjab jails. The contrast between the results of von Pirquet tests in the case of newly imprisoned Pathans at Peshawar and those of Pathans who have served a term in Central Punjab jails, is highly suggestive of initial susceptibility followed by rapid and widespread infection.

In the case, however, both of Gurkhas and Pathans there is too much reason to believe that their native hills are now becoming somewhat widely infected with tuberculosis, although not as yet to a sufficient extent to annul the hyper-susceptibility of the people. Amongst the Wazirs and Mahsuds of the hills around Bannu

the saying is current that if consumption once attacks a household it does not leave it until seven deaths have occurred. Such a saying is suggestive of a population as yet un-immunized to tuberculosis.

Instances of the same susceptibility in the case of young children have been observed again and again after times of famine, when orphans from village homes, having been brought into city environments, have died from consumption with sometimes appalling frequency. The reason for this has been not merely the lowered vitality of the famine orphans, but also the fact that they have been susceptible to a degree of infection to which the ordinary children of the city were comparatively immune.

The well-known susceptibility to tuberculosis of monkeys when in captivity, and the success of efforts made to combat it, are instructive in this connection. At the Zoological Gardens at Vienna, it was I believe formerly the almost invariable rule that monkeys died from tuberculosis within a year of their captivity. A request for information from the Regent's Park Zoological Gardens brought the following interesting information from Dr. Plimmer :—

> "The percentage of deaths in the primates here from tubercle in 1908 was 17 per cent. and for the last 4 years or so it has been about 3 per cent. I do not attribute this improvement to any greater access of fresh air, but rather to the reduction of the number of monkeys kept in the monkey-house (formerly overcrowded), to the weeding out of infected animals, and a quarantine for all new arrivals, with testing of any doubtful cases.
>
> Curiously, in the theoretically worst house in the Gardens there has never been a case of tubercle. This is the anthropoid ape house where the animals are kept behind plate glass, so that ventilation is difficult. I believe that the reason of this is that they are not able to be spat at, this being a favourable amusement with certain classes of visitors to the Gardens."

It is more difficult to give definite examples illustrating the other side of the picture; the actual immunity of those who with their ancestors have been continually

exposed to infection. Certainly in some crowded quarters of cities such as Ahmedabad, Benares, or Amritsar, no other explanation than that some form of special immunity exists would seem to explain the survival of children brought up in such surroundings. There is good reason, however, for the belief that the curious and hitherto unexplained prevalence of various local manifestations of tuberculosis in those cities of India where infection is most rife and sanitary conditions most unsatisfactory, may be the expression of the existence of a wide degree of protective immunization of the inhabitants of such cities. This subject will be alluded to again in connection with surgical tuberculosis, see Chapter VIII.

The question now arises: May we leave Nature to do her own anti-tuberculosis work and be excused from further efforts? Surely not so. Nature is altogether too slow, to her the decimation of many generations will be a small price to pay for the final immunization of the race. We have to work for our own generation, although future ones will share the benefit. What is of vital importance for us, however, is that we should recognize Nature's processes, and organize our efforts not in opposition to them, but in conjunction with them.

This may be thought by some to be on the face of it impossible. Nature's means of prevention depend on the wide dissemination of infection and on the elimination of the unfit. Both of these would seem to be directly contrary to the aims of the human anti-tuberculosis worker. But it is not so in reality. We cannot ever hope to prevent the wide scattering of the bacillus, but we can aim at *avoiding its concentration,* which is what nature requires; that individuals exposed to infection shall receive immunizing but not overpowering or lethal doses of the virus. To use a homely metaphor, which must not be pressed too far, the sanitarian has to recognise the existence of animal excreta and vegetable refuse; he allows them to be spread over the ground as manure, but he tries to prevent their being accumulated at points where harm might result. As to those whose physique and other disabilities prevent their making a

struggle for existence with any chance of success, we may at least aim at segregating such, so that they may not pass on their own ills to others, whether by contagion or (may we not also say), by inheritance.

What practical bearing then have the above-mentioned facts regarding Immunity and Susceptibility upon any general measures which may be proposed with a view to the prevention of tuberculosis?

I. Firstly, the knowledge of the extreme susceptibility to tuberculosis of those who have not hitherto been exposed to infection should throw a new light upon our duties as regards the prevention or spread of infection. Thus:—

(*a*) Every effort should be made to discourage the infection of virgin areas by the immigration to them for health reasons of tuberculous patients. Hitherto for any district in India to become popular as one whose climate is favourable for consumption, has had in many cases the sequel that consumptive patients come and settle in the district without taking any precautions, so that sooner or later the whole countryside becomes infected. In the case of the existing small hill sanatoria with their strictly limited accommodation it is inevitable that when cases, often advanced or unsuitable for admission, come without notice, they have to be refused and may then settle in the neighbourhood.

(*b*) The dangers inherent in sudden changes of environment should be clearly recognised and every attempt made to discourage the inhabitants of areas where consumption is rare from immigrating to infected cities or other tuberculous areas. Where such immigration is unavoidable the duty rests upon those responsible for the care of the new arrivals to provide them with such conditions as regards fresh air and sanitation as may reduce the risk of infection to a minimum. This has special reference to employers of coolie labour in mines, mills, factories, etc., to the heads of educational institutions, and to those in charge of orphanages where village children are received.

II. Secondly, the knowledge that there are natural processes tending towards the elimination of consumption should influence the "orientation" (to use Sanarelli's

term) of our anti-tuberculosis efforts. The fact that the slums of India contain multitudes of people for whom the issue is even now in doubt as to whether their tuberculosis infection shall end in active phthisis or in a protective auto-inoculation should be an added impulse to compel us to be active in all measures which may bring light, air, and cleanliness to Indian homes, and which may lessen overcrowding and help the people towards a more healthy existence. The special risks connected with the concentrated dose of infection, should lead us to lay particular emphasis upon the importance of the removal of "open" and advanced cases of phthisis from city areas where they are such a source of danger, to institutions where they may be cared for in safety.

Above all it should direct our thoughts to the children, and lead us to put in the forefront of all our institutional and other measures for the prevention of tuberculosis those which will give to these the chance which they need. We shall be doing the best preventive work when somehow we can succeed in reaching children who are exposed to infection, before any sign of the disease appears and by a change of environment and regime, temporary it may be, giving to them the needed access of vitality which may enable them to completely realise their auto-immunization and become refractory subjects to tuberculosis infection. The success of the efforts of workers such as Grancher (of Paris) and many others who have tried to reach and deal with children belonging to consumptive families while yet in a pre-tuberculous stage is highly encouraging to any who may be able to organize similar beneficent work in this country. The need for open-air schools and sanatoria especially for children will be dealt with later on.

The most recent opinion, based upon the considerations alluded to on page 78, emphasizes the paramount importance of separating infants up to the age of three years, from all chance of contact with parents or other relatives who may be tuberculous, so as to avoid the danger of the acute and fatal infections which tend to occur at this early age. After this period there is no longer the same advantage in segregation, since

infection is bound to occur sooner or later, and it is well that the gradual immunizing process should not be long delayed. For children then, who are beyond the age of infancy, our efforts should be devoted to the avoidance of "massive infection," and to the maintenance of good general health and the re-establishment of it when it has been temporarily impaired.

In all experimental researches into the problems of immunity, the great aim and expectation is the discovery of some vaccine which shall render it possible to give artificial immunity, whether to protect the healthy or to enable those already infected to escape the danger which threatens them. Nature is doing this slowly for the race, but it rests with science to do it with safety and certainty for the individual.

CHAPTER VII.

BOVINE TUBERCULOSIS IN INDIA.

The question of the prevalence of tuberculosis amongst cattle in any country is of very great importance in view of the intimate connection which is alleged to exist between the bovine and human forms of the disease.

As is well known, Koch in 1901 asserted that the two were practically distinct, and that the susceptibility of man to the bovine disease was so slight as to render it unnecessary to take any protective measures against it. This opinion was however altogether controverted by the British Royal Commission, which made most elaborate inquiries into the subject, and it is generally admitted in Great Britain and America that infection of human beings from cattle is a matter of constant occurrence, and that it takes place almost exclusively by means of milk, either by milk which of itself contains the bacilli, or which has become infected from tuberculous lesions on the udders of the cows providing it.

Many of the animals which come into contact with man shew a greater or less susceptibility to tuberculosis; the bacillus, in the case of mammals, always apparently belonging to one of the two types, human or bovine. While however it is one of the chief characteristics of the bovine bacillus that it shews especial virulence when the more susceptible animals such as monkeys, rabbits or guinea-pigs are inoculated with it, yet it would seem that human beings are more resistant to this than to the human form, since those lesions in man which are found to contain the bovine type of organism are usually of a chronic and inactive character. There is some reason to believe that the human bacillus after it has passed through a series of lower mammals may gradually tend to assume the bovine type and the converse may also well be true, that the bovine bacillus in human hosts may in time change its character accordingly.

The fact that certain common manifestations of the disease in man are found to be caused by the bovine type of bacillus has an important bearing upon causation and

also of course upon the problem of prevention. It may be stated at once that the infection in pulmonary phthisis is exclusively of the human type, it being the rarest exception for bacilli of the bovine type to be found in tuberculous sputum.

It is different, however, when we come to cases of surgical tuberculosis, in which the disease has attacked lymphatic glands, bones, joints, etc., and more especially when such cases occur in children.

Mitchell of Edinburgh published in 1914 a series of 72 cases of tuberculous cervical glands removed by operation from children under 13 years of age; of these he described no less than 90 per cent. as being due to bovine infection. The latest investigations regarding glandular tuberculosis, have given the proportion in Scotland as about 70 per cent. and in England 55.5 per cent. for children under 16 years, the percentage being higher still at the earlier ages.

As regards tuberculosis of bones and joints in children, Fraser of Edinburgh (1912) as a result of examination of 70 specimens obtained by operation, found 58.6 per cent of pure bovine infections. These results have not been confirmed by subsequent observation, although most authorities agree that the proportion of bovine infection is higher in Scotland than in England. The most recent results are those by Eastwood and F. Griffith, who give 21.1 per cent. of bovine infections out of a total of 261 cases in which a pure culture was obtained, (29 per cent. in 155 of these under 10 years of age), and by A. S. Griffith, who gives 14.7 per cent. as the proportion for English cases, and 29.6 as that for Scotland.*

Results such as these have given the scientific basis for the great emphasis which has of recent years been laid upon the question of milk supply in relation to the prevention of tuberculosis amongst children. There has been a tendency amongst certain observers to overgeneralize upon the subject of bovine infection and surgical tuberculosis, and to assume that what has been demonstrated in certain parts of Great Britain is true of all the world ; *viz.*, that surgical tuberculosis in juveniles

* See Cobbett, "The Causes of Tuberculosis," pp. 589-610 and pp. 679-681.

depends necessarily on bovine infection and is almost or entirely absent in countries in which the bovine disease is absent or rare.

The case of India has been quoted in this connection by Dr. Nathan Raw and others, and the comparative absence of bovine tuberculosis in this country has been assumed to be the explanation of the *alleged* infrequency of surgical manifestations of the disease.* This subject, which is one of great importance as regards the epidemiology of tuberculosis in India, will be dealt with in the following chapter. Here it need only be stated that all the evidence from India seems to prove that in this country surgical tuberculosis, which is in many areas excessively prevalent, is entirely independent of infection from bovine sources.

We now have to examine the evidence as to the prevalence of bovine tuberculosis in India. The subject has been somewhat fully discussed in a recent paper by Colonel E. Wilkinson, I.M.S. (Retired), late Sanitary Commissioner for the Punjab. In his "Notes on the Prevalence of Tuberculosis in India," Colonel Wilkinson quotes an interesting mass of evidence contained in a paper on the subject, written in 1902, by Dr. Nield Cook who had been for twelve years Medical Officer of Health, first in Madras, then in Calcutta. Out of many thousands of carcasses personally inspected Dr. Cook had failed to find a single case of tuberculosis, and "as the result of further inquiries he was able to obtain evidence of 60 cases of tuberculosis among cattle in India; 31 of these occurred among the 4,155 patients at the Bengal Veterinary College Hospital between 1893 and 1903, and 21 between 1900 and 1902 amongst the thousands of cattle at the Government Cattle Farm, Hissar, Punjab."

Such recent evidence as I have been able to obtain is unanimous as to the absence of the disease in South India and almost so as to its comparative rarity in the North. As regards South India the Principal of the Veterinary College, Madras, reports that during ten years of service in Southern India he has neither seen nor heard of a single case of tuberculosis amongst cattle.

* "Bovine Tuberculosis conveyed from Animals to Man," "The Tuberculosis Year Book," volume 1, 1914, page 35.

Lt.-Col. T. S. Ross, I.M.S., when Health Officer in Madras, made special investigations with a view to ascertain the presence or otherwise of bovine tuberculosis. Out of a large series of carcasses examined he failed to find any sign of tuberculosis in any single organ, and failed also to find any trace of external tubercle of the udder in a large number of cows examined in the cattlesheds.

Dr. F. M. Gibson, Director of the King Institute of Preventive Medicine, Madras, has never seen a case of bovine tuberculosis in India, and has had no certain evidence that would lead him to believe that it exists. At the Vaccine Depôt in connection with the same Institute no single case of tuberculosis has been detected among over ten thousand calves which have been carefully examined during the last five years.

In Bombay for many years past, careful investigations have been carried on with the object of determining various doubtful points in reference to the prevalence of bovine tuberculosis, and the results up to the present have strongly emphasized the great rarity of this disease in indigenous cattle in the Bombay Presidency. Out of many thousands of cattle examined at the slaughter houses by competent veterinary inspectors, not a single carcass was found to be infected with gross tuberculous lesions. Lt.-Colonel W. Glen Liston, C.I.E., I.M.S., Director of the Bombay Bacteriological Laboratory at Parel, wrote to me in 1916 as follows:—

"We had an interesting outbreak of bovine tuberculosis in the Victoria Gardens, I think it was introduced into the bodies of Llamas which were obtained from Germany some years ago. The disease spread to some spotted deer and a blue bull which were placed in cages adjacent to the Llamas. All the animals have been killed and they all showed signs of the disease. The strain has been proved to be bovine."

As regards indigenous cattle however he writes in February 1920:—

"No case of the disease has been brought to our notice although we have been on the look out for it."

The same observer however has received very occasional single specimens showing true bovine tuberculosis from Lahore and other cities of Northern India and quite recently one from Madras.

Colonel Glen Liston and Dr. Soparkar have been for years examining specimens of human surgical tuberculosis from children, and have so far failed, out of more than 100 cases examined, to find a single specimen showing the bovine type of organism. Control strains of bovine tubercle bacillus from England were used in these experiments for purposes of comparison, but the cultures obtained from Indian cases were quite characteristic, and were invariably of the human type.

Dr. Soparkar writes:—

"In India, at least in the Bombay Presidency, the comparative rarity of human infection caused by tubercle bacilli of the bovine type, in spite of the fact that cowdung is so much used in houses both as fuel and as a dressing upon floors, must be explained by the almost complete absence of bovine tuberculosis in this part of India." *

Colonel K. Hewlett, M.R.C.V.S., Principal of the Bombay Veterinary College, writes as follows:—

"In my opinion tuberculosis is extremely rare, if it occurs at all in this part of India. The hospital attached to the College belongs to the Society for the Prevention of Cruelty to Animals, and there are restrictions regarding destruction of animals, and making post-mortem examinations. However, we always have about 200 bullocks in hospital, and if tuberculosis were common at all we should have some cases showing clinical symptoms, whereas we have had none. We seldom carry out the tuberculin test, but the few tests we have carried out have all been negative. The only way to obtain information on the subject of prevalence of tuberculosis among cattle in India is by slaughter house inspection. No cases have been reported to me from slaughter houses, and hundreds of cattle are slaughtered weekly at Bandra."

The late Dr. L. L. Joshi, of the Bombay Municipality, made systematic examinations of Bombay milk during the years 1910-13. Out of 741 specimens examined, although in 48 of them acid-fast bacilli with characteristics resembling tubercle bacilli were found, yet all attempts to demonstrate tubercle bacilli by inoculation

* "Indian Journal of Medical Research," April 1917, page 635.

experiments upon animals proved uniformly negative. Similar results have been obtained from examination of samples of milk at the Parel Laboratory.*

The Principal of the Bengal Veterinary College, Belgachia, wrote to me in 1915 :—"Admissions to this hospital of cases of tuberculosis in bovines are few. During the last four years there have only been eight such cases. The religious prejudices of the people render investigations into this disease difficult." In reply to a letter asking for more recent information, the same officer, in a letter dated April 1920, after referring to his original letter, writes:—"I have nothing to add to it. One case of tuberculosis only has been detected in this College since the above letter was written."

The Health Officer, Calcutta, writes :—"My own opinion, and this is confirmed by the Veterinary Assistant in charge of the Tangra Slaughter House, where thousands of cattle are slaughtered every year, is that bovine tuberculosis is excessively rare.

From Assam, the Superintendent of the Civil Veterinary Department writes that he has not seen any bovine tuberculosis in Assam, and that no cases have been reported by any veterinary assistant employed in the province. The Superintendent, Veterinary Department, Bihar and Orissa, states that he himself has never seen any cases throughout his service in India.

The Acting Imperial Bacteriologist, writing from the Muktesar Veterinary Laboratory, says:—

"I have made careful inquiries and seen the records and reports for the past eleven years and can find no mention of a single case of tuberculosis amongst the Kumaon Hill cattle which are mainly employed at this laboratory for serum production and experimental work. Veterinary inspectors and laboratory assistants, who have worked here for ten or twelve years, also state that no case has ever been found. As during that period well over a thousand careful post-mortems must have been made, it can be confidently stated that the disease is rare in the hill cattle of this district.

Recently I found the bacilli in lung lesions from a lion that died at the Karachi Zoological Gardens."

* "The Milk Problem in Indian Cities," by Lemuel L. Joshi, B. Sc., M.D., p. 69.

Mr. E. Keventer, the managing proprietor of the most important private dairy establishment in India, of which the headquarters are at Aligarh, informs me that in his 25 years of work in India, he has only once seen a cow which he suspected of tuberculosis, and that even in this one case the event shewed him to have been mistaken. He, like most other observers, attributes the rarity of the disease to the fact that in this country cattle are kept out in the open air to a greater extent than in Europe. This may be a sufficient explanation in some parts of the country, but in others, and especially in cities, cattle are kept quite as much shut up as in the West.

At Cawnpore an inquiry was made in 1912 under the Veterinary Department, a veterinary inspector being deputed to examine carcasses at one of the large slaughter houses. Out of nearly 2,000 carcasses examined, 3 per cent. were said to have been affected with tuberculosis in varying degrees. I may add however with reference to to this rather high percentage of cases, that doubtful specimens collected recently by the Health Officer, and sent from Cawnpore to Parel for confirmation, were regarded at the latter laboratory as certainly non-tuberculous.

The Superintendent of the Civil Veterinary Department of the United Provinces believes from morbid specimens received at his laboratory from time to time that the disease exists in several parts of the province.

Colonel Pease, C.I.E., Principal of the Punjab Veterinary College, Lahore, writes as follows:—"Judging from many personal observations I can say that tuberculosis in cattle does exist to some extent. But so far as I know it is not very common, and I should say that bovine tuberculosis is practically a negligible factor in the production of tuberculosis in man in this country."

During the last few years a considerable number of cases of tuberculosis have been discovered in cattle slaughtered at Ferozepore in the Southern Punjab. Investigations were made into these cases by Mr. G. Taylor of the Punjab Veterinary Department, during the period August 1915 to March 1916, and out of 2,701 cattle examined, no fewer than 95, or 3.5 per cent., were found to show naked-eye appearances of tuberculosis; while in

60 of these, or 2.2 per cent., the presence of tubercle bacilli was confirmed microscopically. In 1916-17, from 1st April to 31st March, out of 3,789 cattle slaughtered, 125, or 3.3 per cent., were found to be infected. It should be mentioned that of the total number brought for slaughter during these two periods, *i.e.*, 7,886, no fewer than 1,396 had already been rejected as being—owing to disease, old age, etc.—unfit for human consumption. The inclusion of these rejected cattle would doubtless have still further raised the percentage of infected cases.

The animals infected were without exception females. The tuberculous lesions were in many cases very slight, and for the most part limited to the bronchial and mediastinal glands, with not infrequent nodules in the lungs. In only one case, a cow of about 9 years of age, was anything resembling a generalized condition of the disease found, and this was the only one in which the udder was affected.*

It is of course possible that further careful investigations in Northern Indian cities may disclose other local foci of the disease.

It is noteworthy that the cases of bovine tuberculosis, which are found from time to time in Northern India, occur almost invariably amongst cattle in the crowded cities of the Punjab and the United Provinces, where the human disease is most rife, and where, owing to the cold, the custom is most common for cattle and human beings to exist together, spending the nights in wholly unventilated mud huts. I am not aware of any authoritative investigations having been made which can be said to definitely negative the suspicion that some at least of the cases of tuberculosis in bovines in India, may in reality be the result of direct infection from man.

We find then that bovine tuberculosis is practically an unknown disease throughout the whole of Southern India; that although in certain centres in Northern India occasional cases have been found, yet even these have been limited to slight glandular lesions, and never generalized, and that the authorities of veterinary colleges in

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*"Bovine Tuberculosis in the Punjab" by G. Taylor, "Indian Journal of Medical Research," Jan. 1918.

various parts of the country are constantly unable to obtain clinical or pathological material for demonstration of the disease to the students.

The significance of the facts given above will be better appreciated if for the purpose of comparison we give a few details as to the prevalence of bovine tuberculosis in Western countries.

Out of 15,000 cattle tested with tuberculin in England during the years 1897-99, the majority of which were milch cows, 26 per cent. reacted. Young and Walker in Aberdeen, employing the tuberculin test, with careful confirmation by post-mortem examination, found out of 240 cattle, no less than 77, or 32 per cent., to be tuberculous. A similar careful investigation by Delépine at Manchester and elsewhere gave 30 per cent. infected out of 375. Both these results showed conclusively that infection increases very markedly with the age of the animals examined, the percentage rising to 76 for cattle over 10 years in age. Cows were found to be infected in a considerably higher proportion than bullocks.

In America, out of 400,000 animals tested in 1908 with tuberculin, 9.25 per cent. reacted; in Norway in 1907 the proportion was 8.3 per cent; in 1912 it was only 4.8. In Austria in 1905, out of 40,000 cattle tested 35 per cent. reacted. Melvin, Chief of the Bureau of Animal Industry in the United States, estimated as a result of reports on 7,000,000 cattle slaughtered in 1908 that "more than 1 per cent. of the beef cattle slaughtered in the United States are affected with tuberculosis in some degree," and he adds that 10 per cent. of the dairy cattle are tuberculous.*

As regards cow's milk, numerous investigations carried on in London, Manchester, and other towns of the United Kingdom and also in large cities of America and Europe, have agreed in placing the proportion of specimens of milk containing virulent tubercle bacilli as high as 10 per cent.†

From these figures we see how negligible in comparison is the amount of bovine tuberculosis found in

* The above details are taken from Cobbett's "Causes of Tuberculosis," pp. 375-380.

† Liston and Soparkar, "Indian Journal of Medical Research," July 1917.

India. This peculiarity is also shared by other Eastern countries, as for instance, the Straits Settlements and Japan.

A careful series of investigations was recently undertaken at the Parel Laboratory by Colonel Glen Liston and Dr. Soparkar, with the object of ascertaining whether or no there is a greater resistance to tuberculosis on the part of Indian as compared with English cattle. It was found that inoculation with a dose of culture of bovine tubercle bacillus which had been found to cause rapidly fatal acute tuberculosis in the case of English calves, caused far less severe symptoms in the case of Indian calves. To quote from the report of these experiments :—

"While the experiments of the Royal Commission show that, with rare exceptions (1 out of 35) all English calves die of acute tuberculosis when inoculated with 50 mgms. of a culture of bovine tubercle bacillus, our experiments prove that at least 50 per cent. (6 out of 12) of Indian calves whether they be buffalo or cow calves, live for many days after a similar dose of culture of the bovine bacillus, and when killed show only retrogressive or healing tuberculous lesions.

The experiment confirms the general experience that Indian cattle are less commonly affected by tuberculosis than English cattle are, and supports the view that the comparative infrequency of the disease among cattle in India *is due to a natural resistance*, rather than to any method of housing or keeping cattle in India, as compared with England."*

A further point noted by Glen Liston was that cross-breeds were more susceptible to tuberculosis than calves entirely Indian, the introduction of an English strain apparently decreasing the resistance of the offspring.

If Indian cattle do possess any real immunity to tuberculosis, an inquiry into the causes of such immunity might lead to results of great practical interest and importance. It has been suggested by Cobbett, "The Causes of Tuberculosis," p. 384, that the susceptibility of cows to tuberculosis infection may be in part a result of unnatural

* "Indian Milch Cattle and Tuberculosis," by W. Glen Liston and M. B. Soparkar, "Indian Journal of Medical Research," July 1917. (The italics are mine.)

development by artificial selection, of the organs and processes of lactation. If this be so, may we not perhaps attribute the greater resistance of the Eastern cow to the fact that such deliberate selection, or breeding for milk, has not been widely practised. It is difficult to inspect the filthy close "byres" which exist in great numbers in many of the northern cities of India, without feeling that the rarity of bovine tuberculosis in India must be due to some increased resistance to the disease, quite apart from the more open-air environment to which it is generally ascribed.

Other facts worthy of consideration in this connection are that a very large proportion of the milk used, especially in villages, is from buffaloes, which are less susceptible than cows to tuberculosis, and also that there is a great and increasing tendency to the use of the milk of goats, which are generally regarded as specially resistant to the disease.

From the practical standpoint of prevention, this question of the prevalence of bovine tuberculosis in India, loses very much of its importance from the fact that it is the almost universal custom throughout the whole country to boil milk immediately after it has been drawn from the cow. I have made careful inquiries in all parts of India, both as to the universality of the practice and also as to whether the custom of boiling amounted to an actual sterilisation of the milk, and in practically all cases the replies were strongly affirmative. In certain parts as, *e. g.*, the Central Punjab, although all milk sold in shops has been well boiled, yet it is by no means uncommon for those who are well off and can keep cows themselves, to drink the milk unboiled or "kutcha." It is supposed to be more cooling in the hot weather, and is sometimes prescribed by "hakims." Goat's milk too is often taken fresh. Such instances, however, are merely exceptions to a rule of very general application, and since (*a*) the boiled milk is usually preferred as regards its taste, (*b*) it is regarded as more digestible, and (*c*) boiling is an undoubted economy (owing to its preventing fermentative changes), it need be no cause of wonder that the practice is widespread. As to the effectual sterilisation of milk resulting from the boiling as ordinarily practised, all informants were unanimous.

In conclusion, there seems to be ample evidence to justify the deliberate opinion that in India, bovine tuberculosis does not at present call for serious consideration as an important cause of the human disease, and that measures taken with a view to the improvement of the milk supply should be directed towards the prevention of contamination *after* it has been drawn, rather than towards the elimination of tuberculosis from the cow.

Similar reports as to the rarity of bovine tuberculosis come from Burma, while the possibility of human infection from cow's milk is further reduced by the fact that the Burmese use it only to a very small extent. The villagers as a rule dislike cow's milk and do not use it, while even in the case of infants a common substitute for mother's milk after weaning is boiled rice, which is given to the child after being chewed to a soft pulp in the mother's mouth. The use of condensed (tinned) milk is increasing rapidly in Rangoon.

CHAPTER VIII.

SURGICAL TUBERCULOSIS IN INDIA.

Although of course consumption or pulmonary phthisis is by far the most common manifestation of tuberculosis, yet there is probably not a single organ of the body which is secure from the attack of the tubercle bacillus. Thus when the disease selects the lymphatic glands of the neck, axilla, or other parts, we have the condition formerly known as scrofula, but which is now known to be almost invariably tuberculosis. When the skin is affected, we have the chronic ulcers to which the name "lupus" is applied.

In the abdomen various conditions are produced according to the particular part affected. In children there is the very common "tabes mesenterica" or "tuberculous peritonitis," in which there is chronic inflammation of the peritoneum, often with fluid effusion, and usually accompanied by tuberculous inflammation of the abdominal lymphatic glands. The obstinate diarrhœa, which is such a common complication of ordinary phthisis, is due to tuberculous enteritis, *i.e.*, inflammation and ulceration of the lining membrane of the intestine, caused no doubt as a rule by direct infection of the bowel, as a result of the swallowing of sputum containing the bacilli in large numbers. Tuberculosis of the kidney (tuberculous nephritis) is by no means infrequent, causing inflammation of the organ, ending in suppuration and consequent presence of pus in the urine. When the membranous coverings of the brain are involved, we have "tuberculous meningitis," one of the most fatal forms of "brain fever," occurring usually in young children.

Tuberculosis is by far the most frequent cause of the painful affections of bones and joints in young patients. It causes a gradual inflammation and softening of bones (caries), leading, if not arrested, to their crumbling away and to the formation of abscesses. In the case of the ordinary "spinal disease," the tuberculous process involves the front part of several adjacent vertebræ causing them to fall together and thus

producing the backward angular curvature, which is a characteristic feature of this painful disease. As a frequent consequence abscesses are formed and discharged by sinuses in the loin, which are difficult to heal and which gradually drain the strength of the patient until death often results from exhaustion.

In the case of the joints it is sometimes the head of the bone which is chiefly affected, sometimes the lining synovial membrane of the joint, sometimes both. In either case unless the most careful treatment is adopted from the first, and often in spite of it, the disease progresses to destruction of the joint and crippling of the patient and not infrequently to loss of life. The ordinary "disease of hip," "of knee" or ankle, etc., occurring in children is due to tuberculosis, and the same disease very frequently also attacks the small bones and joints of the hand and foot. Various parts of the eye and ear are also not seldom the centres of tuberculous inflammation, whilst "laryngeal phthisis," in which there is tuberculous ulceration of the interior of the larynx, is one of the most intractable and fatal forms of the disease.

It is a constantly observed fact that while tuberculosis of the lungs and larynx occurs most frequently amongst young adults, the various forms of the disease in other organs, including those local manifestations which can only be dealt with effectively by surgical means, are very commonly found in children. So true is this that the prevalence of the various forms of non-pulmonary tuberculosis in a given area may be regarded as affording, in India no less than in England, a very fair index to the prevalence of tuberculosis amongst children in that area. Amongst *young* children the most frequent forms of the disease are perhaps "tabes mesenterica," spinal and hip disease, and tuberculous meningitis, whilst the other varieties mentioned, especially tubercle of lymphatic glands, are shared between children and those of youthful age up to about 18 years.

Some of the most rapid of all cases of tuberculosis are those of so-called "general tuberculosis," in which many of the organs of the body are simultaneously invaded by the disease, which shows itself in multitudes of small "miliary" tubercles, scattered, it may be

throughout the lungs, abdomen, liver, brain, or other parts. Such cases are inevitably and rapidly fatal, and not infrequently occur in quite young children.

We now come to the consideration of the relative prevalence in different parts of India of these various non-pulmonary forms of consumption. This is an epidemiological question of no small importance, the more so since the facts, which seem to emerge from careful inquiry, are in some respects at variance with opinions which have been widely held and publicly expressed.

By many writers, especially those whose experience has been mainly acquired in Bengal, it has been assumed almost as an established fact that surgical tuberculosis, and indeed all forms of the disease in children, are very infrequent throughout India. Again and again a statement by Chevers, in his "Diseases of India," published so late as 1886, has been quoted, in which he says: "I never saw a case of strumous cervical glands in a native of the plains of India, a great part of which I have traversed keeping my eyes wide open." My own experience of hospital work in the Central Punjab dates from only five years later than this, and I am able to state positively that in Amritsar, in 1891, cases of tuberculous disease of glands, as well as of bones and joints, were of extremely frequent occurrence. I have abundant and incontrovertible evidence to the same effect regarding many other centres in Northern India.

Tuberculous Inflammation of Lymphatic Glands:—

The evidence obtained during the recent inquiry was conclusive as to the great prevalence of tuberculosis of lymphatic glands especially amongst children, in many parts of the country. At Lucknow, the Health Officer recently examined 103 children of school-going age and found that no less than 39 had distinctly enlarged cervical or axillary glands. At Benares, medical opinion, both Indian and European, agreed as to the excessive frequency of tuberculous gland affections, especially "cervical lymphangitis" and "tabes mesenterica" in young children. In one crowded quarter of Peshawar City, out of 713 children of ages between 4 and 12 years, 296 were found to have enlarged cervical glands.

Results such as these, together with the general correspondence which hospital statistics seemed to shew, between the relative prevalence of pulmonary and glandular tuberculosis suggested to me the possibility of utilizing the proportion of cases of tuberculous enlargement of the cervical glands amongst the children of a limited community, as an indication of the prevalence of tuberculosis in that community. With a view to investigating this point, I examined, during a subsequent tour through cities of Northern India and Burma, no fewer than 9,128 children, distributed amongst schools of various kinds, and as far as possible representative of various classes and communities. The detailed results of this investigation will be found elsewhere,* but a brief summary will be of interest here.

Of the total number examined, 2,692, or 29.49 per cent. of the whole, shewed definite enlargement of the glands of the neck, the proportion varying from 9.1 per cent. in a high class girls' boarding school in the U. P.; 11.3 per cent., and 12 per cent., amongst Buddhist children in healthy districts of Burma, or 14.2 per cent. amongst the Hindu children of Lyallpur, a town laid out 25 years ago on generous "town-planning" lines, in a canal colonization area of the Central Punjab, at the one end of the scale; to proportions of over 40 per cent. in the slums of some of the great cities, at the other. The highest of all were 68.42 per. cent. in Mahomedan Primary Schools in the poorest quarters of Ahmedabad City, and 57.27 per cent. in similar schools in Surat.

In such centres, where the percentage was excessively high, one was struck by the large proportion of cases shewing well-defined strings of multiple small hard glands, indicative—to myself at least—of chronic and continuous infection, as contrasted with the cases, commoner where conditions were more favourable, in which the presence of only one or two enlarged glands, softer and more elastic to the touch, seemed to suggest a more recent infection.

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*"The Gland Index in Tuberculosis," "Indian Journal of Medical Research," October, 1916.

The possibility of non-tuberculous enlargement of glands was of course constantly in mind. Pyogenic infection from sores of the skin, or from unhealthy conditions of the mucous membrane of the fauces, and the irritation consequent on the presence of pediculi in the hair were the most frequent obvious causes of such enlargement. Glands in the hinder portion of the neck are often non-tuberculous and these were not counted. Although it was not possible, as a routine practice, to examine either the heads or mouths of all the children, yet any cases presenting dirty heads or obvious sores were at once rejected, and in every school a sufficient number of heads were examined as to the presence or absence of ova, to justify the assumption that this source of error was not present to any considerable extent. In several cases whole schools or villages were excluded from examination or record owing to this cause.

It may be further remarked that a high percentage of cases of gland enlargement in a boarding school, even if not in great measure from tuberculous infection, never failed to coincide with some unhygienic conditions, as to overcrowding, dietary, cleanliness, etc., which urgently called for notice and remedy.

One remarkable point which emerged at the very outset of the investigation, was the fact that the percentage decreased rapidly from the age of about 12 years onwards, shewing that the gland enlargement was in a large proportion of cases, only of a temporary character. This decline with age was so marked that it was found necessary to limit the examinations to children below the age of 12 years, and as a rule only the Primary Department was included in the inspections.

It was this fact which has compelled me to the strong belief, (mentioned in the chapter on Immunity and Susceptibility) that a constant and considerable dosage of tuberculous infection in young children, especially when the "administration" is largely alimentary, tends towards primary infection of the lymph glands, followed in the favourable cases, by protective immunity from the disease.

As regards many of the schools from which the highest percentages were obtained, the conditions of over-

crowding and sanitation of the schools themselves, as well as of the homes from which the children came, were such as would seem to forbid the possibility of any child escaping severe infection with tuberculosis. Such institutions were in almost every case day schools under private management, in which literally the only limit as regards overcrowding was the number of children who could be packed—sitting closely upon the mud floors—into the squalid rooms in which teaching was carried on. Both in such schools, and in the homes of a corresponding class, it is the ever-present and surely infective dust, which would seem to provide the continuous dosage of bacillary poison mentioned above.

In schools where the proportion was far smaller, it was possible in numberless cases of pronounced glandular enlargement, to obtain on personal inquiry, instant and clear evidence of actual tuberculosis contact.* The conclusion reached from the investigation was that while such a "gland index" method needs to be further safeguarded, (especially as regards the elimination of cases of gland-inflammation from non-tuberculous causes), yet it has very decided possibilities as a rough indication of the prevalence of the disease in a community or locality.

The very high proportion of cases shewing glandular enlargement will cause surprise. The percentage of such cases amongst about 240,000 children belonging to the London School Board, examined in 1913, was 10.5, falling to 8.8 in 1914. The limitation of the examination, as above mentioned, to little children, resulted in a far higher proportion of positive cases than would otherwise have been obtained.

It may be noted that other observers (see above, page 101) have obtained equally high figures in Indian cities where tuberculosis is known to be prevalent.

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* Thus regarding one girls' school, I have the following notes:—

1. Out of one family of four sisters, three had enlarged glands.
2. Two sisters, both with enlarged glands, had an elder sister, then in hospital with pulmonary phthisis.

Further, similar examinations of school children in various cities of Europe have given percentages of cases shewing cervical gland enlargement even higher than those given above, one observer, Laser, after an examination of 1,216 children coming to the conclusion that—excluding other causes of such enlargement—in from 32.4 to 58.9 of the cases, tuberculous glands were present.*

Other forms of Surgical Tuberculosis:—

Examining the in-patient returns for three months of eight hospitals in Northern India, in which diagnoses as to tubercle were made with particular care, I find that of 244 cases of non-pulmonary tuberculosis 45 were in little children under 12. Surgeons with much experience of hospital work in the cities of Northern India are unanimous in asserting the frequency with which they have to treat surgical tuberculosis in children. Even in Calcutta, I found in the Dufferin Hospital for Women and Children, that out of 10 patients in the Children's Ward there were 6 suffering from undoubted tuberculosis, viz., 2 cases of extensive tuberculous cervical glands, 2 of tuberculous knee disease (one requiring amputation), 1 of lupus and 1 of metatarsal caries. Also Dr. Webb, the Superintendent, informed me that after three years' previous experience at Delhi she had failed to observe any marked difference in the frequency of the disease amongst children in the two cities. Mortality returns, and especially post-mortem returns, are almost valueless as showing the frequency of juvenile surgical tuberculosis, since the disease in such cases is far less fatal than is phthisis, and children suffering from surgical

3. One girl, who had had repeated operations for tuberculous cervical glands, had two sisters, one of whom had enlarged glands.

At another girls' boarding school, I was asked to examine a class of nine pupil teachers. Of the three which were found to have enlarged glands, one had lost her mother two years ago from rapid consumption; the second had lost three sisters, and the third had lost two brothers, all from phthisis.

*Quoted by Harbitz, "Lymph Node Tuberculosis during Childhood," "Journal of Infectious Diseases," March, 1905.

complaints are rarely permitted by their parents to die in hospital.

Turning now to the general question of the prevalence of the various forms of surgical tuberculosis throughout India, we find remarkable variations in different parts of the country. In the investigation of this branch of the subject one main source of information was necessarily the statistical returns of hospitals. Here one was at once confronted with the difficulty, that cases of tuberculous diseases of various organs are as a general rule entered under the regional heading, as affections of the particular organ, rather than under the pathological heading of tuberculosis. In the civil hospital of one large city where I knew that tuberculous glands were prevalent, the number of out-patient cases returned under "other forms of tuberculosis" rose at once from 15 to 173, on my mentioning that of course tuberculosis of lymphatic glands should be included. More than once on inspecting a hospital and noting the various patients in the wards, I have found the number of obvious cases of surgical tuberculosis (the diagnoses of the Civil Surgeon agreeing with my own) in the wards at that one time, greater than the total number of such cases returned for the previous year, the majority having been entered under such headings as "inflammation and suppuration of lymphatic glands," "diseases of organs of locomotion," "—of generation," "—of the genito-urinary system," "other diseases of the digestive system," etc. This difficulty has already been alluded to in Chapter II, on Statistics, see page 20.

In the case of some hospitals, it was clear from the system of registration that patients had been so classified as to insure accuracy of the returns for the subject under inquiry; at others, the Superintendents kindly arranged for the preparation of special returns for a period of three months, particular attention being given to the correct classification of tuberculosis cases. A few of such returns are given below, from which, as from the miscellaneous details which follow, it will be seen how greatly the proportion of cases of surgical tuberculosis to the total number of admissions varies in different parts of India :—

Tuberculosis Admissions in Indian Hospitals.

Hospital.	Period.	Total In-patients.	T. of Lungs.	T. of Glands.	T. of Abdomen.	T. of Bones, and Joints, Sinuses, etc.	T. Various.	Total cases of Tuberculosis.	T. % of Total In-patients	Total Non-pulmonary Tuberculosis.	% Non-pulmonary T. of Total In-patients.
Lahore (Mayo)	2 yrs.	9,595	414	166	39	244	29	892	9·3	478	4·9
Peshawar (C. M. S.) ..	4 mos.	708	14	23	6	27	1	71	10·0	57	8·0
*Bombay (Cama)	3 mos.	308	21	17	28	15	4	75	24·3	54	17·5
Ludhiana (Zenana) ...	1 year	1,660	19	23	30	18	...	88	5·3	69	4·1
Ahmedabad	5 yrs.	12,225	511	147	34	102	...	799	6·5	288	2·3
Agra (Thomason)	1 year	2,256	136	9	9	44	25	223	9·8	87	3·8
*Agra (Dufferin)	4 yrs.	5,374	327	66	137	154	59	753	14·0	416	7·7
Vizagapatam	3 yrs.	4,995	54	7	4	43	...	108	2·1	54	1·1
Calcutta (Dufferin) ...	3 mos.	461	6	5	2	6	1	20	4·3	14	3·0
	Year										
Bannu (C. M. S.)	1913	1,640	17	37	...	33	11	98	5·97	81	4 93
,, ,, ...	1914	1,691	14	32	1	33	19	99	5·85	85	5·03
,, ,, ...	1915	1,655	17	47	4	24	22	114	6·88	97	5·86
Peshawar C. M. S.) ...	1911	1,693	27	40	8	42	26	143	8·44	116	6·85
,, ,, ...	1912	1,611	24	31	4	31	19	109	6·76	85	5·27
,, ,, ...	1913	1,989	35	30	11	41	27	144	7·24	109	5·48
,, ,, ...	1914	1,755	32	40	6	44	36	158	9·00	126	7·17
,, ,, ...	1915	1,685	31	39	6	53	11	140	8·30	109	6·46

* Excluding Maternity cases

In the above return, the very high proportion of tuberculosis cases both pulmonary and non-pulmonary, in the Zenana Hospitals at Bombay and Agra, will be noted. In the case of the hospitals at Bannu and Peshawar, where the returns for successive years have been given, it will be noted how very nearly constant is the proportion between the numbers of the various forms of tuberculosis, in hospitals under a continuous regime.

In the case of the vast majority of hospitals, however, there was no detailed sub-division of non-pulmonary cases, and for the reason above given it was as a rule impossible to regard the entries under "other forms of tuberculosis" as even approximately representing the total number of such cases.

A few details, however, may be added :—

Calcutta.—At the Presidency General Hospital, the average number of annual admissions during the five years 1909—14, was 83 cases of pulmonary tuberculosis, but only 14 of all other forms of the disease including bones, joints, glands, brain, intestine and peritoneum. At the Medical College Hospital in 1913 out of 1,044 surgical cases under one Surgeon, only 19 were entered under "other forms of tuberculosis," while out of 1,004 cases under another Surgeon only 2 were similarly entered, giving 1.0 per cent. as the proportion of cases of surgical tuberculosis on the total of 2,048 surgical cases. At the Mayo Hospital, out of a total of 2,112 in-patients in 1913, only 9 were "other forms of tuberculosis" (*i.e.*, 4 per cent). As shewing the way in which cases are entered under their regional rather than their pathological heading, I may say that at the time of my visit to the two last-mentioned hospitals there were in the wards at least half as many cases of undoubted surgical tuberculosis as were given in the records for the whole previous year. I do not, however, doubt that the proportion of cases of tuberculosis of bones and joints is far lower in Calcutta and also in other parts of Bengal, including Dacca, than it is in the United Provinces and the Punjab.

Madras.—At the General Hospital, in the wards of the Second Surgeon, out of a total of 1,016 surgical cases, there were 27 of tuberculosis of bones and joints, 18 of which were cases of spinal disease. In the wards

of the Third Surgeon, out of a total of 1,250 surgical cases there were 25 of all forms of surgical tuberculosis, including 14 of bones, 10 of glands and 1 of testis (a proportion of 2 per cent). In this hospital there were altogether 140 cases of "other forms of tuberculosis," but out of the 179 cases of "inflammation and suppuration of lymphatic glands," necessitating 196 operations by excision, incision or curetting, it is probable that a considerable number may have been tuberculous in origin.

At the Civil Hospital, Hyderabad (Sind), there were on the day of my visit 14 cases of surgical tuberculosis, out of 43 surgical cases, many of the remainder at this great stone centre being cases of vesical calculus.

At the Women's Memorial Hospital, Ludhiana, there were in three months, out of a total of 267 surgical cases, 69 of surgical tuberculosis, *i.e.*, 25.8 per cent.

Out of 177 in-patients present on one day at the General Hospital, Hyderabad-Deccan, there were 16 cases of tuberculosis. Of this number 4 were cases of pulmonary phthisis, and 12 of other forms of the disease, as follows :—Abdominal and intestinal, 6 ; bones and joints, 4 ; glands of neck, 1 ; glands of medastinum, 1.

The value of any returns shewing the relative proportion between cases of pulmonary and non-pulmonary tuberculosis amongst hospital in-patients is discounted to some extent by the varying freedom with which phthisical patients are admitted into different institutions. A few illustrative figures, however, are given below :—

Hospital.	Period.	Tuberculosis of lungs.	Other forms of tuberculosis.	
Madras (General) ..	1 year	346	140	
Poona (Sassoon) ..	10 years	1,359	752	
Rangoon	5 „	2,793	941	
Baroda	1¾ „	97	77	
Jabalpur	4 „	141	113	
Madura	3 „	120	63	A.
Calicut	3 „	71	15	
Bombay (Tuberc. Dispensary)	2 „	605	437	
Lahore (Tuberc. Dispensary)	1 year	255	106	
Patna and Bhagalpur ..	5 years	223	94	

(A) Tuberculosis of lungs more numerous.

Hospital.	Period.	Tuberculosis of lungs.	Other forms of tuberculosis.	
Hyderabad (Deccan) ..	1½ years	204	875	B.
Udaipur (Lansdowne) ..	4 ,,	172	374	
Gwalior	4 ,,	502	1,159	
Baroda (Tuberc. Dispensary)	1¾ year	39	134	

(B) Other forms of tuberculosis more numerous.

In the out-patient departments of many hospitals in Northern India I have found on an analysis of the registers that the total number of cases of non-pulmonary tuberculosis far exceeds those of phthisis proper.

Hospital Out-Patient Returns.

Hospital.	Year.	Tuberculosis of Glands.	Tuberculosis of Abdomen.	Tuberculosis of Bones and Joints.	Other forms of Tuberculosis.	Total Non-pulmonary Tuberculosis.	Pulmonary Tuberculosis.	Total cases of Tuberculosis.
Amritsar ...	1915	77	11	64	52	204	93	297
Ahmedabad ...	1914	104	...	70	67	241	150	391
Bombay Anti-Tuberculosis League Dispensary ...	1915	118	42	24	40	224	277	501
Dera Ismail Khan ...	1915	41	5	22	4	72	30	102
Bannu ...	1915 (4 mos)	39	...	6	1	46	18	64

The chronicity of cases of surgical tuberculosis, and the long time which they often remain under treatment tends to give an exaggerated impression as to the proportion of such cases in a hospital. Again the deep-rooted

objection which parents have to operative treatment in the case of children—*especially where perfect cure cannot be guaranteed*—means that an immense number of cases of surgical affections of bones and joints never receive treatment as in-patients. Tuberculous glands on the other hand are dreaded as being in young adults, often followed by phthisis, and operation upon them is so commonly successful that it is no longer feared.

Speaking in general terms it seems quite certain that surgical tuberculosis is met with most frequently in the Punjab, United Provinces, Gujerat, and Bombay, while its prevalence, both absolutely and relatively to the number of cases of pulmonary phthisis, is less throughout Central India and Bengal, reaching its minimum in Madras and the South. Even on the Malabar Coast, where pulmonary phthisis is so prevalent, the various forms of surgical tuberculosis seemed decidedly infrequent.

It was very noticeable that in Southern India, and to a lesser extent in Bengal, such cases of non-pulmonary tuberculosis as did occur were for the most part cases of glandular or intestinal disease, tuberculosis of bones, joints and other organs being conspicuous by their rarity. This inequality of distribution was a marked feature in the reports of hospital surgeons in Southern India, and its explanation presents an interesting problem for further inquiry.

It was in the crowded cities of Northern India that cases of tuberculosis of bones, joints and other organs, in which the disease would seem to depend upon systemic infection, were reported as occurring with great frequency.

An analysis of the facts ascertained seems to bring out the following points:—

1. The areas where surgical tuberculosis is relatively infrequent are the areas where climate permits a largely open-air existence, and dwellings of an open style of construction.

2. These are also the areas in which pulmonary tuberculosis is least prevalent.

3. Those cases of non-pulmonary tuberculosis which do occur in such areas are for the most part those which may be supposed to result from direct infection of the organs implicated, *e.g.*, the cervical glands from direct

infection of the mouth, tonsils, pharynx, etc., and the intestinal tract and mesenteric glands from direct infection through sputum, food or dust.

4. The forms of non-pulmonary tuberculosis which are specially rare in such areas are those in which the disease must depend upon a systemic blood infection (*i.e.*, tuberculosis of bones, joints, kidneys, brain, etc.), and these are only found in considerable prevalence where the climatic and social conditions conduce to a great concentration of the tuberculous infection.

5. The prevalence of cases of "Ingestion Tuberculosis" in young children, including disease of cervical glands, is greatest where the pulmonary disease is most prevalent, and where conditions conduce to the greatest degree of concentration of the bacillary poison.

In attempting now to generalize upon the subject I would venture to make the following tentative suggestions:—

1. Hyper-susceptible individuals, whether children or adults, tend to contract pulmonary tuberculosis (usually in an acute form) on coming into a region of high infectivity. Amongst such individuals surgical tuberculosis is infrequent. As instances we may note the cases of famine orphans brought up in cities and Pathan convicts in city jails.

2. Where there is high infectivity and low susceptibility on the part of the individuals exposed to it, we find a large relative proportion of cases of surgical tuberculosis. This is what might be expected to occur with children belonging to and brought up in a tuberculous environment in cities. Their immunity, inherited or acquired, seems to protect them from the acute phthisis in infancy which otherwise might seem to be their inevitable fate, while the fact that they are continually exposed to the tubercle bacillus in quantity ensures their becoming early infected. This is shown by the high percentage of positive von Pirquet results obtained from children in such circumstances. If the degree of immunity be high there will be nothing more than a very slight infection limited perhaps to lymphatic glands, and effecting a true auto-inoculation against future attacks. If, on the other hand, unfavourable circumstances be too strong, then a progressive infection

takes place, which instead of being protective against pulmonary phthisis seems very often to lead directly to it.

In confirmation of the above we actually find in such highly infected localities:—

(*a*) A very high percentage of positive von Pirquet results obtained from young children.

(*b*) A comparatively large relative proportion of cases of surgical tuberculosis, especially in children.

(*c*) Numerous cases of individuals, both children and adults, who while escaping phthisis show signs of healed gland or other lesions.

(*d*) Frequent cases of active surgical tuberculosis passing on to the pulmonary disease as early adult life is reached.

The last two classes of cases account for the apparently contradictory observations that early surgical tuberculosis is often protective against phthisis, and on the other hand, that phthisis frequently occurs as the final complication of surgical tuberculosis. The favourable or unfavourable character of the ultimate event depends, as has been explained, upon whether the surgical tuberculosis results in final healing or whether it becomes active and progressive.

Whatever measure of truth there may be in surmises such as these, the subject is of undoubted importance, especially in view of the fact that in India the element of bovine infection may probably be eliminated as an active agent in the production of surgical tuberculosis in children. In India as in England, the infection in such cases is probably alimentary, but *here the medium of infection is not milk*. The habits of the children, the use of the floor in the place of table and chairs, and the common carelessness as regards contamination of food by flies or dust give ample opportunity for the specific organism everywhere abundant to gain an entrance to the mouth and alimentary tract.

The question as to the precise route of infection in the cases in which the disease is necessarily systemic, that is, in which the tubercle bacilli must have reached the distant organ through the circulation, has been much debated. The fact seems to have been decisively established that infection of the blood-stream can take place through the normal uninjured intestinal mucous

membrane, and the general opinion is that in such cases as tuberculous disease of bones or joints this is probably what has occurred.

If this be so, it presupposes what has already been postulated for cases of surgical tuberculosis, a prolonged or continuous exposure to infection, or an exposure to infection in a very virulent or concentrated form.* It has been proved by experiment upon animals, that a far larger dose of tubercle bacilli is required to produce the disease when it is administered by ingestion, than when it is given either by inhalation or inoculation. It is difficult to say what actually determines the location of the disease in a particular bone, joint, etc. In some cases the determining factor is undoubtedly an injury, which so impairs the local vitality as to furnish a suitable spot in which the organism may develop, in others there would seem to be a local "embolism," or blocking of a small capillary blood vessel by a clump of bacilli, which in time set up their characteristic inflammation.

In these cases of local manifestations of tuberculosis it is noteworthy that the complete removal of the focus of the disease seems often to turn the scale in the patient's favour, resulting not only in the cure of all general secondary symptoms, fever, emaciation, etc., which were formerly present, but also in the establishment of a protective immunity which gives safety from future infection. This happy result of operative treatment is usually conditional upon its being undertaken at an early date, before multiple active foci of disease have appeared. In such cases of comparatively inactive localised tuberculous affections there seems no doubt at all that the use of tuberculin is often a valuable auxiliary to surgical and other treatment. Amongst the various forms of abdominal tuberculosis, especially in young adults, a somewhat common one is tuberculosis of the cæcum. The treatment of this condition by resection is so satisfactory as to emphasize the importance of its early recognition before surrounding glands have had time to become involved.

* The importance of "the influence of dose" of the bacillary poison, in reference to questions regarding immunity and infection in the case of tuberculosis, has been clearly pointed out by Cobbett, *op. cit.*, Chap. V, pp. 60-67, *q.v.*

Part II.

THE CAUSATION OF TUBERCULOSIS IN INDIA.

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THE CAUSATION OF TUBERCULOSIS IN INDIA.

CHAPTER IX.

INTRODUCTORY—THE TUBERCLE BACILLUS.

We come now to a discussion of the various social and other factors which inquiry seems to indicate as being connected to a greater or less extent with the spread of tuberculosis in India. Some of these factors are due to simple ignorance of the elementary laws of health; some the result of economic problems as difficult to solve as that of poverty itself; some the product of social customs which may or may not prove capable of gradual modification in the interests of the community. I have tried to approach the various questions relating to the causation of consumption in India with an open mind, and with much caution, realising how closely many of them are connected with the home life of the people.

At every point in the inquiry, the greatest pains were taken to obtain guidance and suggestions from the most reliable sources; no conclusion or opinion has been recorded which has not been tested again and again by reference to experienced authorities, both Indian and European. In Western countries, there has been, during the last 30 years, a complete revolution in the ideas ordinarily current upon many matters relating to health, and on no subject has this change been more marked than as regards the value of fresh air in the treatment and prevention of consumption. The ideas still commonly held in India as to the supposed injurious effect of fresh air in consumption,

and the advantages of a warm, closed room, are exactly similar to those current in England 30 or 40 years ago.

The change in Western thought has come about mainly as a consequence of a single scientific discovery, that by Prof. R. Koch of Berlin in 1882, of the tubercle bacillus as the direct cause of consumption and of the other forms of tuberculosis. Inasmuch as every detail of our present knowledge, both as to the causation and the prevention of the disease, is intimately bound up with the facts as demonstrated regarding this living organism, it will give completeness to this section if the briefest possible description of the tubercle bacillus be here inserted:—

The Tubercle Bacillus is a minute non-motile organism classed amongst the lowest forms of life, and consisting of a slender rod measuring from the one-fifteen thousandth to the one-seven thousandth of an inch in length, or from about ¼ to ½ the diameter of a red blood corpuscle. Its thickness is about one-tenth of its length, and under high powers of the microscope it is often seen to present a "beaded" appearance, owing apparently to there being alternate sections of its length which stain less deeply than the remainder.

It was proved by Koch in the most absolute way that the disease under consideration depends upon the presence of this living organism and of no other. It was found in cases of tuberculosis in whatever part of the body the disease existed, and in the sputum of phthisical patients. By growing it in test tubes upon suitably prepared soil or "media," it was possible to cultivate generation after generation, gradually freeing it from all admixture with other living organisms. When a "pure culture" of the tubercle bacillus had thus been obtained, it was found that by inoculating it into rabbits or guinea pigs, the disease of tuberculosis was reproduced, precisely resembling the original disease in microscopical and other characters.

Tubercle bacilli are present in enormous numbers in the sputum of patients suffering from advanced phthisis, it having been estimated that the expectoration from one such case may contain as many as four billions of the organisms during 24 hours. They are contained

in the discharges from other tuberculous lesions, as for instance in the fæces in cases of intestinal tubercle, in the urine when the disease attacks the kidneys, and—in far smaller numbers—in the discharges from other tuberculous ulcerated surfaces as from lupus or ulcerated tuberculous glands. For practical purposes as regards the spread of infection, it may be assumed, however, that the sputum, the secretion from the lung which has been infected with the tubercle bacillus, and now contains deposits in process of breaking down, is the great source whereby the disease is spread from man to man.

The detection of the bacillus in discharges or tissues, which may of course contain multitudes of other micro-organisms as well, depends upon its special reaction towards anilin staining agents. It is, as compared with other bacteria, difficult to stain, and when once stained, difficult to unstain. Thus in order to detect it in a specimen, say of sputum or lung, it is necessary first to use a more powerful stain than is required for most other purposes, and afterwards to use some decolorizing agent such as strong acid, which almost instantly washes out the colour from any other similar organisms which might be mistaken for it, while the tubercle bacilli still remain stained. If now another kind of stain be used which shows up the structural details of the containing substance but leaves the tubercle organisms unchanged, we see the latter scattered more or less thickly *in situ*.

From the practical point of view of infection and its prevention, it is of course of the utmost importance to know the conditions of life of the bacillus and especially how it may most readily be destroyed. Happily for mankind the tubercle bacillus is not one of the most resistant of micro-organisms; it is not like a weed which will flourish anywhere and everywhere, and which can with difficulty be destroyed. In the laboratory test tube, it will not increase and multiply unless it have a carefully prepared soil or medium, and be kept at a temperature regulated at a point slightly above that of human blood. So also in order for it to increase in the human body certain conditions have to be fulfilled. The perfectly healthy human body has the power of destroying the vitality of the bacillus, unless the dose is very large, or the exposure to infection prolonged; it is only

when owing to one cause or another the resisting power of the body has been diminished, that the tubercle bacillus finds a suitable soil and commences to propagate. We shall have occasion to return to this fact again and again in the course of our inquiry as to the causation of the disease.

Although for active propagation somewhat strict conditions have to be fulfilled in the case of the tubercle bacillus, yet it possesses a considerable power of resistance to external influences without losing its vitality. The dried sputum of a consumptive patient has been found on repeated experiments to retain its virulence for six or eight weeks; while in moist dark places, such as in the corners of damp rooms, it may remain still capable of reproducing the disease after six months or more. It retains its vitality in water, milk, etc., and is by no means rapidly destroyed by putrefactive changes in organic matter in which it may be contained.

On the other hand, the limits of this resisting power in the case of the tubercle bacillus are fairly well defined, and it is very easy to destroy it when the appropriate means are used. Exposure to bright sunlight rapidly kills it, while in diffused daylight it loses its vitality in a few days. The tubercle bacillus is almost immediately destroyed by boiling, and within a few minutes by exposure to carbolic acid solution (one part in 20).

Some important observations on the vitality of the tuberculosis bacillus outside the body have been made recently by Dr. M. B. Soparkar at the Bombay Bacteriological Laboratory. It was found that:—

1. Tubercle bacilli in sputum, when exposed to direct sunlight, were alive for six hours, but dead after eight hours.

2. When the sputum was exposed to diffused daylight, they were found alive for six days, but were dead after eight days.

3. When the sputum was kept in darkness, even when it was completely desiccated, the tubercle bacilli contained therein were found alive and virulent for 309 days (10 months).

4. From decomposing sputum living tubercle bacilli could be isolated after twenty days but not after twenty-six days.

5. Bovine tubercle bacilli were found to be more resistant to sunlight and diffused daylight than human tubercle bacilli.

6. When exposed to electric light the bovine bacilli were found alive for 74 days, but dead after 100 days.

7. It took three to four hours in direct sunlight, and three to four days in diffused daylight, for a pellet of sputum to become sufficiently dried to be capable of being reduced to dust.

8. It is easier to reduce to dust sputum dried on dusty surfaces than on glazed surfaces.

The following practical conclusions are drawn by Dr. Soparkar:—

"It is evident from these experiments that there is an appreciable period after the complete drying of the sputum, during which some of the tubercle bacilli contained therein remain alive. In the case of direct sunlight the time is approximately two hours; this interval is not long, and the danger of infection from tuberculous sputum deposited in open places exposed to the sun cannot therefore be considered to be great."

"In the case of sputum deposited in a place exposed to diffused daylight, the interval during which sputum dust may remain infective can be calculated in days. But here, too, the tubercle bacilli soon lose their virulence if the place be well lighted, the rate at which the tubercle bacilli become devitalised probably depending upon the intensity of the light."

"The danger of spreading infection is greatest when sputum is deposited indoors, especially in dark ill-ventilated places. In these conditions we have seen that tubercle bacilli may retain their vitality and power to cause the disease as long as 309 days."

(Paper on "Vitality of Tubercle Bacilli outside the body." *Indian Journal of Medical Research*, 1917.)

For the disinfection of phthisical sputum perhaps the most suitable antiseptics for common use are carbolic lotion as above, lysol (2 per cent. solution), izal (1 part in 50) or cyllin (2 oz. to 2 gallons of water). The solution in each case ought to be well mixed with the sputum in at least equal quantities and should be allowed to stand for two hours. While the above chemicals when carefully used may be depended upon to destroy the infectivity of sputum containing tubercle bacilli, yet for absolute safety incineration is the best. The best method in the home is to empty the expectoration upon an open fire and then to cleanse the containing vessel with boiling water or lotion, some of which is permitted to remain in the vessel for future use.

The bacillus which causes tuberculosis in cattle differs in certain characteristics from the "human" form. Thus it tends to be shorter, stouter, and more curved in shape; is more difficult to cultivate artificially, and is more virulent when used for inoculation experiments on animals, especially rabbits. The two type forms, however, shade into one another by imperceptible gradations, and it is not usually possible to state with certainty from

the examination of a single specimen, to which of the two classes of the disease, human or bovine, the particular case belonged. Recognition depends mainly upon cultural and inoculation tests.

Upon this basis of ascertained facts rests our whole structure of anti-tuberculosis measures, as well as our theories as regards the causation of the disease.

CHAPTER X.

POVERTY AND OVERCROWDING.

In all countries tuberculosis is regarded as essentially a disease dependent upon poverty and overcrowding. To discuss the causes and cures of poverty would take us far beyond our present limits, but it may be said that the dependence of tuberculosis upon poverty is probably not nearly so immediate in India as in colder climates. Over vast tracts of the country poverty does not necessitate overcrowding, nor does living in the open air entail hardship. Actual starvation as in times of famine, undoubtedly prepares the way for phthisis, but where there is not concurrent overcrowding, it is usually by other diseases that poverty and hunger destroy life.

On the other hand, overcrowding must certainly be accorded the first place in enumerating the general causes contributing to the spread of tuberculosis, provided always that the term be applied in relation to *ventilation*; that is, to the freedom of the supply of oxygen to the persons in a given space. If an enclosed building is such that those within it have a sufficient amount of fresh air to breathe, then that building is not overcrowded in the sense in which the word is here used.

Overcrowding in this sense tends towards the spread of consumption in three ways:—

1. By the multiplication of opportunities for contact and infection.

2. By the absence of the free currents of air which would disperse tubercle bacilli present, thus reducing to a minimum the risk of infection involved in 1.

3. By the loss of vitality and of power of resistance due to the same absence of fresh air.

The mere statement of the number of persons per acre in a town often fails to give an accurate estimate of the degree of overcrowding. Thus actual overcrowding in Bombay, of which the average population per acre is 67, while the worst areas give 638 persons per acre, is probably not worse than in Calcutta, where the numbers are 39 and 255, respectively, since in the former case

people are accommodated in "chawls" several stories high, while in the latter they live to a large extent in one-story "basti" huts. Much depends upon economy in the use of site-areas, and still more upon careful planning of the houses erected; here Indian domestic architecture is most seriously lacking.

No useful purpose would be served by giving details of the appalling instances of overcrowding, and of the insanitary conditions under which people live, as observed in various parts of India. There is hardly a town where instances may not at once be found by those who care to seek for them. Many of the older cities in Northern India, especially those of importance as commercial or religious centres, have areas of extreme overcrowding, the condition as shown by enumeration being far more serious than would otherwise be the case, owing to the fact that houses built long ago in utter defiance of all laws of sanitation, with provision neither for light nor air, are now occupied by many more than they were originally intended to accommodate. The faulty planning of many such houses exaggerates greatly the evils of overcrowding. Thus in Lahore, with 465 persons to the acre in certain areas, Cawnpore with 563, Amritsar with an average of 180 per acre *throughout the city*, and other equally crowded cities, we find conditions which favour in every possible way the spread of tuberculosis.* In Bombay it is reckoned that 76 per cent. of all families dwell in one-room tenements.

The evils resulting from overcrowding in the Northerly parts of India, tend to be far greater than those in the South, from the fact that the cold during a part of the year drives the people to shut themselves closely in their houses, and still more, leads to a style of architecture which discourages ventilation. Nowhere could these conditions be worse than in the inner rooms of the mud houses of Punjab villages, or in the cave dwellings of certain of the trans-frontier tribesmen.

To effect any general great transformation of the housing conditions of the poor is a stupendous task which would require limitless money and decades of time.

* The average density of the city of Birmingham is 20.2 persons per acre; that of the ward which is most overcrowded is 101·3 per acre.

There is much however that can be done, and we may at least aim towards a steady improvement. It has been most striking in the course of my tour of inquiry, to contrast the cities where all the authorities, municipal president, secretary, health officer, civil surgeon, district magistrate, are working together, determined to improve the conditions in every possible way, and those where the same officials are going quietly on in the old paths, content with things as they are.

In one place one finds new schemes in the air; continual activity; a health officer enthusiastic in his work and backed up by those whom he serves, knowing all the danger spots in his city, but able to point with pride to a new window here, an open space there, a *gali* repaved or a depression filled up, as recent results of his efforts. Such activity is infectious and spreads to the members of the municipal committee, so that opposition and conservatism tend to lessen as practical improvements manifest themselves.

In another centre one will find the health officer discouraged, and attempting nothing but his routine work of food examination, sanitary inspections, and the like, with no voice as to the improvement of dwelling houses, and afraid to interfere even if he had the power to do so, because of the risk of offending the members of the committee who employ him. In such a place there will be no building bye-laws, and no opportunity for dealing with the plans of new buildings on medical lines. The one thing which the committee is insistent to observe and check is the attempt on the part of an owner to encroach upon the public highway by building out a shop platform! That same owner may build hovels utterly unfit for human habitation, lowering instead of raising the prosperity of the city and the vitality of its inhabitants, and no word will be said. The committee are careful to guard the city property as they guard their own. They are careless of the health of their city, even as too often they are of that of their own homes.

The position of the health officer in a city is necessarily a very difficult one; if he does his duty, he is almost bound to come into conflict sooner or later with the owners of house property, since his recommendations

will appear to be opposed to their interests. These latter may stir up local feeling with a view to placing hindrances in his way, or may even attempt to bring influence to bear upon the members of the Municipal Committee to injure his official position. Only the greatest tact and forbearance will enable him to effect improvements without friction; and it may be even sometimes wise for him to delay making proposals for schemes which may seem to be urgently indicated, until he shall have earned the real confidence of the city leaders.

It is greatly to be hoped that Municipal Councils may to an ever-increasing extent attract the services of men whose chief desire is for the well-being of their fellow-citizens; they offer unlimited opportunities for gaining that experience in public work which is so especially necessary at the present juncture, and for exercising the responsibilities of unselfish administration. It is a too frequent complaint from health officers that their best efforts meet with a discouraging lack of support from their Committees, owing largely to the fact that individual members are without the needed knowledge of the hygienic principles involved. *Per contra* one energetic and popular health officer told me that in 75 per cent. of all plans of new buildings submitted to him he made some modification (often, of course, trivial), in the direction of improving sanitation or ventilation, etc., and that after an initial period of opposition his suggestions were now almost invariably met with cheerful acquiescence. It is easy to understand how a process of this kind acts in "levelling up" the standard of house-building, setting a fashion which will in due course lead to a demand for better conditions. Many Indian cities show to-day on all sides the results of this vastly improved style of architecture. In many, alas, the reverse is the case. Improvement in these respects will necessarily depend upon a gradual change in public opinion regarding civic responsibilities, and this in turn calls for widespread diffusion of knowledge regarding health matters generally.

One simple measure of reform which might tend in many cities to a greatly increased activity as regards sanitary administration, would be the establishment by the Municipal Council of a Sanitary Sub-Committee to

have full responsibility for dealing with all matters relating to public health. The subjects of sanitation, conservancy, sewage disposal, and probably water supply, as well as the control and prevention of epidemic disease, would all be under this Sub-Committee, which should be small, and consist as far as possible of experts —medical men, sanitary engineers, etc.—and others who have taken special interest in social problems. In India at present only a very few of the largest cities have a separate committee of this kind; whereas in the United Kingdom almost every Town Council has its Sanitary Committee, and in many cases it is now the practice to co-opt as members, experts who may not themselves be members of the general council.

Apart from the popularizing of provision for more light and air in city houses which will gradually follow a more enlightened "sanitary conscience," I would venture to mention two very simple measures of improvement which are of enormous importance as regards the conditions of the more crowded quarters. Of these one is inexpensive; the far wider use of ordinary whitewash on account of its effect both in cleansing and in lighting up interiors. The increase of light due to reflection from mud walls when they have been whitewashed is often quite remarkable, and where light comes cleanliness often follows.

The second is the pukka paving of side *galis* (or alleys), especially when this is done with smooth impervious material and with surface drains of the same. The effect of this in changing the whole aspect of a city area is extraordinary. In a mud-paved *gali*, or even in one with worn or imperfect "brick-on-edge" paving with all its irregularities, every side drain from a house means a foul spot; the more water the more filthy is the pathway, and where there is filth already, more may naturally be deposited. A fall of rain means deep mud for many days. In a well-paved *gali*, however, each addition of water helps to flush the whole pathway, while rain is a blessing instead of a curse as far as cleanliness of the area is concerned. Cleanliness becomes *easy* and the whole sanitary standard of the neighbourhood is raised.

It is common for health officers to think that the remedy for most sanitation difficulties lies in some

expensive scheme for underground (and therefore *out of sight*) drainage. In all but large cities I feel sure that the money will be better spent in improving the surface drainage of streets and lanes. The filthy drains at the sides of most of the small city bazaars, filled with stagnant, malodorous fluid, and crowded with myriads of flies, are an abomination and disgrace.

Economy in Site Areas.—One direction in which the tendency to overcrowding might be gradually corrected lies in the wiser and more economical treatment of city site areas. Indian cities are as a rule more strictly circumscribed than those of the West, many of them being actually walled. When this is the case it is of the greatest importance that the ground within the city boundaries should be used to the full advantage to accommodate the population. Yet what do we find? Large areas lying waste, useful neither as "lungs" nor for habitation, but only as a repository for refuse of all kinds. A fire has occurred ten years ago, and the officials of the municipal committee have exhausted themselves in sending notices ordering the owners to rebuild, yet without effect, and they seem to be powerless. Or in a badly overcrowded area there will be a number of houses dating from a bygone age; no longer occupied, or else let out to poor people who for accommodation wholly unsuited for them pay only a fraction of what the rent ought to be. In other cases, large spaces in an important populous city will be occupied by miserable one-storied huts, suitable enough for a village, but utterly out of place in a city. If these could be cleared away, and carefully designed two-storied houses substituted, the same number of people could be accommodated under infinitely better conditions, and with an economy of site area which would admit of wider roads and more open spaces.

In such cases a wiser utilisation of the areas in question would be fraught with immediate advantage to all parties concerned; to the city as a whole, to the dwellers, and last but not least to the owners of the houses or sites. Nothing, however, is done and the authorities, except in the largest cities, seldom take action. They could acquire an area under the terms of the Land Acquisition Act, but are, as a rule, unwilling to

do so unless it can be shown that the site is needed for some public building. There seems to be a widespread impression that the term "public purpose" in the wording of this Act does not cover the acquisition of areas merely with a view to city improvements.

In Lucknow the floods of 1915, by reducing to ruins the houses over a large section of the City, have afforded the opportunity for greatly improving the planning and house accommodation over the area in question. The Land Acquisition Act was brought into operation to give the necessary powers, but most of the transactions were voluntary. It would seem that a cautious but more extended use of the powers of land acquisition on the part of local authorities might in very many cases solve the difficult problem of opening up and utilising waste city areas. Might it not thus be possible in the case of such areas, which from their position are of special importance in regard to the development of a city, and whose owners are themselves unable or unwilling to utilise them, for the local authority either—

(*a*) To purchase compulsorily and build themselves, or resell under building restrictions, or

(*b*) To effect exchange with extra-mural land acquired beforehand for the purpose?

In many parts of India, what is needed is new legislation whereby increased powers may be given to Municipal Boards in the direction of control over rebuilding and alterations, the removal of insanitary houses, the laying out of streets and their realignment, the securing of a certain minimum of ventilation and air space, the paving and drainage of streets and the gradual improvement of the standard in cities.

The so-called "joint-family system" by which the various members of a family remain together, sharing the original abode and sub-dividing it as the family increases, is responsible for a vast amount of overcrowding, which is disconnected from poverty, but which has deplorable results as regards the health of those affected. A house which, as originally built, may have been fairly well-planned, becomes hopelessly insanitary when its arrangements have been all altered by sub-division, and light and air excluded, because of the necessity for partial

seclusion of members of the various sub-families from each other.

There are many cities in India in which the advent of plague, or even the fear of it, has been a blessing in disguise, succeeding where all other measures had failed, in forcing the people to leave their crowded habitations and seek a more open life outside their city, and also in some cases frightening the local authorities into schemes for town extension.

For most city dwellings a light and inexpensive style of architecture is preferable. This favours change and change means progress. Indian houses should not be made to last too long! The cities whose houses have been built of brick, timber, or even of lath and plaster are the ones which show the greatest progress as regards improvement in domestic sanitation. Of all Indian cities those built of stone seem to be the most hopeless in this respect. The ancient custom of changing the site of a city every two or three centuries, whether voluntarily or from compulsion, had certainly its advantages from the point of view of sanitation.

Raja Jai Singh showed true wisdom when he decided to evacuate his overcrowded unhealthy city of Amber and to found the new, far more commodious, city of Jaipur a few miles distant; but he made a crowning blunder when he built it wholly of stone. To-day Jaipur, with its 145,000 inhabitants, the pride of its citizens and the wonder of all visitors because of its broad thoroughfares, is the most crowded and one of the most unhealthy cities of all India.* Stone houses many stories high, surrounding a courtyard perhaps a dozen feet square, and built to accommodate a single family, now have separate families in every room. There is no rebuilding as there is no falling down, and the chances of regeneration of such a city seem remote indeed.

Organized efforts to lessen overcrowding.—The various improvement schemes which have done and are

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*Of the 30 cities with a population of more than 100,000, the list as regards density is headed by :—

Jaipur, with 45,699 per square mile.
Bombay, with 42,585 per square mile.
Surat, with 38,289 per square mile.

Jaipur shewed a death-rate of 63.45 in 1912, 43.34 in 1915, 49.90 being the average for 39 years.

doing so very much to effect a change for the better in many of the larger cities of India, have usually placed in the forefront of their aims the clearing away of insanitary dwellings and the lessening of overcrowding. It may perhaps be doubted whether in this latter respect expectations have been realized, as they obviously have been in regard to the beautifying of cities and the opening out of new thoroughfares. There is probably no scheme for city improvement, of which it has not been said with more or less truth that the obvious improvements effected have been at the cost of still greater overcrowding in neighbouring areas.

These schemes work mainly in two directions; by the demolition of insanitary slums, and the opening out of city extensions. The one destroys a certain number of dwellings unfit for habitation, while the other provides new dwellings for a superior class of residents. But the difficulties involved in providing new and sanitary accommodation for the *very poor*, those expropriated in the course of the opening up of crowded areas, are so great that comparatively little success seems to have been achieved in this direction.

In Hyderabad (Deccan), an attempt has very recently been made to deal with this problem by erecting model sanitary dwellings for the poorest of the people. In addition to the six lakhs of rupees annually granted by H. E. H. The Nizam's Government towards the City Improvement Board, a supplementary sum of two lakhs each year has been set aside for the special object of providing this badly-needed extra house accommodation. The experiment has great promise of success.

Although it is an accepted axiom in city improvement work that measures for re-housing ought to precede expropriation, yet in too many cases the providing of new broad thoroughfares or open spaces has in fact involved increased congestion of the surrounding areas. The difficulty seems to lie in providing new dwellings, which shall be at the same time sanitary and attractive, while yet being so inexpensive as to be financially profitable to the landlords. Most of the "model chawls" and coolie lines which have been erected by philanthropists or mill-owners, while usually sanitary in construction, fail for some

reason to attract those for whom they were intended, or else cost so much money that they become occupied by a superior class of tenants, the very poor being unable to pay the rent charged.

What seems to be needed is a definite recognition of the principle that the expenditure of even a large sum of money in improving the housing conditions of the poorest classes, is not a matter merely of philanthropy, but one of the soundest civic economy. The services rendered by the labouring classes are essential to the well-being of the community, and for those services to be easily available it is as a rule necessary that the workers should live within the city area. They can only do this on the pay which they receive by living under conditions which constitute a menace to the health of the community. The improvement of those conditions by the subsidising of housing schemes or otherwise, forms therefore a wholly legitimate charge upon the funds of Municipalities or City Improvement Boards, while in the case of schemes for providing accommodation outside the city area, it becomes the duty of the local authorities to give the necessary facilities for transport.*

In this connection Calcutta presents many points of interest. With its extensive areas occupied by one-story "basti" huts, constructed merely of matting or bamboo strips on a framework of light bamboo, it would seem to show a typical example of the wasteful use of valuable city sites. Even if it be admitted that the "basti" hut is the most suitable habitation for the lowest class of the population, surely it would be possible to render them far more sanitary than at present. The huts are usually arranged with no attempt at regularity, leaving in all directions narrow,

*Note.—A Bombay Memorandum in dealing with this subject emphasizes its importance in the following terms : "The solution of the problem involved is essential for the future of sanitation in this Presidency and we consider that a beginning should be made by the adoption of a minimum standard of accommodation and construction for buildings. As the matter is urgent we attach as basis for discussion a note on huts drawn up at an informal conference called together by Mr. B. W. Kissan, I.C.S." This very useful note will be found in Appendix A.

vacant corners and spaces which are choked with rubbish; the latrines are often close to the main entrance or immediately beneath the only window of a living room, while the floor is of mud and frequently below the level of the roadway outside. The huts, which could be destroyed and built up again for probably Rs. 30 or Rs. 40, seem never to be renewed but are repaired and patched up again and again until little of the original fabric remains. I inspected one "basti" settlement consisting of eleven rooms crowded into the back yard, which measured 36 feet by 36 feet, of a brick house, itself let out in lodgings. These eleven rooms brought a total of Rs. 33 per mensem in rent, and accommodated between 40 and 50 persons, amongst whom were several cases of phthisis. In another "basti" hut I found a man and his wife suffering from advanced phthisis, three members of another family who had preceded them in the same hut, having died from the same disease.

In the case of dwellings so very cheap in construction, surely it might be possible for the Improvement Trust, in conjunction with the Corporation, to take them in hand and insist on the owners rebuilding them after a given term of years, according to definite instructions laid down, thus arranging for the position of the latrines and the avoidance of useless vacant spaces. The Improvement Trust might on their part provide a pukka plinth above the level of the surrounding road, which of itself would at once vastly improve the sanitary condition of the whole "basti." They might wisely also acquire by compulsory purchase at least those huts which front upon thoroughfares, putting their sites to a more profitable use. At present even the new settlements which are extending on the outskirts of the city seem to be laid out without any very definite plan or arrangement.

It is often argued that these matting huts are healthier than more substantial structures, in virtue of their light and airy character permitting of a certain freedom of ventilation. This contention would be very true were the periodical renewal of such huts to be made compulsory. As they are, however, at present in Calcutta, surrounded by refuse and occupied largely by rubbish, their walls grimed with smoke and their

interstices choked with dust and cobwebs, they provide an almost ideal habitat for the germs of many infectious diseases.

We may see the advantage of careful arrangement of such temporary huts at the Labourers' Settlement recently laid out at Liari near Karachi. These colonies, which contain nearly 40,000 inhabitants, are composed of huts built merely of "chitai" matting for walls and roof on a light bamboo framework; the huts are, however, arranged with careful regularity, the width of roads and side lanes being fixed, and spaces for public latrines being left outside the "bastis" at convenient centres. No latrines are allowed within a group of huts, and the floors of the dwellings must always be raised. Separate sites measuring 20 feet by 20 feet are let out at Re. 1 per annum, on the condition that they may be taken up at short notice when a more ambitious scheme of town extension becomes practicable.

It is difficult to imagine that in the case of a large city like Calcutta we have reached finality with the "basti" hut. It should surely be possible to design two-story dwellings of light construction which would not greatly interfere with the light and air of the more pretentious buildings around, but would enable the present population on a given site to be accommodated under far more favourable conditions than in these matting huts, even if improved as has been suggested.

It is true that many "bastis" have been cleared away from the better class quarters, during the past few years, in the course of the operations of the Improvement Board, but this particular type of habitation is so exceedingly bad, that one would think it might be dealt with on its own demerits, apart from any special town-planning programme.

As regards the frontage sites of the better city bazaars,—those which are sufficiently important to possess or profit by footpaths—it would seem that more use could wisely be made of the colonnade style of building, an overhanging upper-story verandah being supported by iron or timber columns at the edge of the pathway. This improves the whole property immensely for everybody, giving foot passengers shelter from sun and rain and enabling them with comfort to inspect the

goods of the shopkeepers (to the obvious advantage of the latter), while for those living above and especially for the women, the gain of having a covered verandah where they may remain in the open air by day and even by night in privacy and safety is very great, and more than compensates for any loss of air and light in the non-residential lower stories.

We have surely had enough of houses built in a haphazard way with little attempt at careful design with reference to beauty, comfort, or sanitation. The successful designing of Indian houses can only be done by those who belong to the people for whose dwellings they plan. India has her thousands of capable lawyers and doctors. Where are her architects?

CHAPTER XI.

SOCIAL CUSTOMS REGARDING WOMEN.

There are certain social customs and observances regarding women in India which, although so deeply entrenched behind popular feeling and prejudice as to discourage all interference, may not rightly be overlooked by any one who seeks to discover the causes of the spread of tuberculosis.

The fact that in many cities of India more than twice as many women as men suffer from consumption, and the still more serious fact that in the Punjab there are only 817 adult women to every 1,000 men (as contrasted with Madras where there are 1,032, or the United Kingdom where the proportion is 1,068 per 1,000 men), should prepare us to examine this question carefully and dispassionately.

There are certain points in relation to the prevalence of tuberculosis in England which seem to have an important bearing upon the question of the sex distribution of the disease in India. During the past sixty years there has been a most remarkable decline in the tuberculosis death-rate in England, amounting according to the best authorities to over 50 per cent. This decline was well marked long before the period of special anti-tuberculosis measures, so must be regarded as in the main independent of this. Various explanations of it have been put forward but there can be little doubt that the general phrase (Ransome's) "amelioration of social conditions" covers most of the causative factors concerned.

What is specially worthy of note however in the present connection is the fact that the above-mentioned decline in death-rate from tuberculosis has been very much more marked in the case of females than males, and that this disparity occurs not in childhood but in all ages after 15 years, becoming most marked during middle age.*

* **Note.**—"It may be said in general terms then, that during the latter half of life, namely, from 35 to 75, the female mortality from tuberculosis declines at least half as much again, and

Most writers have explained this curiously unequal rate of decline, by referring to the immense growth of industrialism during recent years, which may well have prevented men from profiting so much as women from the general betterment of social and sanitary conditions. There is doubtless much truth in this explanation, but I would venture to suggest that an almost equally important cause may be found in the great change in the habits of women of the upper and middle classes that has occurred during the period under consideration. England had her own "purdah system," but has given it up and is now reaping the reward. No one can read the literature of social life during the early and mid-Victorian period without being struck by the sedentary character of the lives led by the women (excepting those of the poorer classes) and by the frequency with which consumption or "decline" is mentioned. They lived in closed rooms; they considered any work excepting embroidery to be un-ladylike, and discouraged all active exercise as being unsuited to the sex. This prevailing attitude of mind found its fitting expression in the crinoline and in the practice of tight lacing. All this has gone for ever, and the physique of England's womanhood has gained immeasurably by the change.

Whatever may be the actual explanation, the fact remains that in the year before the War (according to the Registrar-General's Annual Report for 1913), in England "the mortality of males (from tuberculosis) exceeded that of females by about one-third. The excess was greater in town than in country; it was 68 per cent. in London and 41 per cent. in the country boroughs, but only 8 per cent. in the rural districts. Urban conditions of life increase the risk of tubercle among males much more than among females, the excess of the London rate over that of the rural districts being 91 per cent. for the former sex but only 33 per cent. for the latter."

Bearing in mind then that in England, and especially in cities, tuberculosis attacks women far less than men, let us turn to India to examine the sex distribution there.

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from 45 to 55 nearly twice as much as the male mortality." See Cobbett's "The Causes of Tuberculosis," 1917, p. 37. This author gives careful statistics of the above-mentioned facts and discusses their causes in detail.

The following figures are typical of those which might be obtained from almost every city in Northern India:—

In Calcutta 45 per cent. of the total deaths from phthisis occurred (in 1913) amongst women, although these constituted only 33 per cent. of the population. The female death-rate from phthisis was 3.3 per mille while the male rate was only 2.0. The phthisis death-rate for Mahomedan women was 5.8 as against 3.0 for Hindus, and in one crowded Mahomedan ward it reached the startling figure of 12.8 per mille.

At Lahore, the Health Officer's Report for 1913, gives the following figures:—

	Mahomedans.		Hindus.		Others.	
	Male.	Female.	Male.	Female.	Male.	Female.
Deaths from phthisis	150	299	59	86	15	21

Males ... ... 224 } = 630
Females ... ... 406 }

Taking three cities from the northerly part of the Bombay Presidency we find the following tuberculosis death-rates for 1915-16:—

Tuberculosis death-rates.	Mahomedans.		Hindus.	
	Male.	Female.	Male.	Female.
Ahmedabad	2·84	4·4	4·3	4·6
Surat	1·53	3·27	2·12	2·9
Broach	1·7	4·9	2·13	2·3

In each of these we see the large excess of the female rate over the male in the case of Mahomedans, while for the Hindus the rates are almost equal. The very high rate for Hindus both for men and women at Ahmedabad is probably attributable to the extremely unfavourable conditions under which the poorest of the people live, in this crowded and ill-drained industrial centre.

Perhaps the most illustrative case is that of Rander, which is a small town, about 4 miles from Surat, inhabited mostly by Mahomedan merchants, many of them of great wealth. It stands in a healthy district and the town itself would seem to be satisfactory from a general sanitation point of view.

Here the tuberculosis death-rate is 2.53, but when we examine this death-rate by sex and communities we find the following:—

Tuberculosis death-rate.	Mahomedans.		Hindus.	
	Male.	Female.	Male.	Female.
Rander	2·15	6·7	1·05	1·36

Here the Mahomedans belong to a far higher social level than the Hindus, and would have a great advantage over them as regards food and clothing, but amongst the former the purdah system is observed with special strictness, while amongst the Hindus it is completely absent. It is very difficult to explain the above figures except with reference to this one social custom, the observance of which differs so markedly amongst the two communities.

The contrast between different communities is even more marked in the case of Burma, where amongst the Buddhists the prevalence of tuberculosis amongst men is almost invariably higher than amongst women. This community observes no purdah, and the women, in many of the cities, live probably a more open-air life than the men. Phthisis among the latter is largely found amongst those engaged in sedentary occupations, such as clerks, students, etc. This contrast is well illustrated in the case of Rangoon:—

Tuberculosis death-rate.	Mahomedans.		Buddhists.	
	Male.	Female.	Male.	Female.
Rangoon	1·49	3·57	3·03	1·79

Here we see that the excess of the male rate over the female is almost as great amongst Buddhists as the

excess of the female over the male amongst Mahomedans, being approximately twice as much in each case.

We come now to a more detailed consideration of some of the social customs which may have a causative importance in this connection :—

1. The Seclusion of Women.—In the whole of my tour through the cities of India no single fact was more constantly brought to my notice by ceaseless reiteration than the direct dependence of consumption upon the system of purdah seclusion of women. The reports which came day after day from informants of every class and kind were such as follows :—" Consumption is not bad here except among the purdah women," " Consumption is severe, especially amongst the purdah women," or " There is scarcely a zenana in this quarter of the city which has not some case of tuberculosis "! The unanimity of such verdicts made it impossible to feel any doubt as to their general truth. Experienced civil surgeons, medical missionaries, lady doctors and Indian practitioners as well as non-medical men and women with intimate acquaintance with the home life in their immediate neighbourhood, all had the same tale to tell.

One of the most famous *hakims* in Northern India said : " It is our purdah system which accounts for the frequency of consumption amongst our women." When one inquired as to which community in a city or district suffered most, the reply would constantly show that it was no matter of race or religion that made the difference. Where there was purdah it was the women who suffered ; where the Hindus were free and the Mussalman women kept purdah with strictness, they were the ones. Where, as in Rajputana, the Hindus were also strict they suffered no less. In regions with a mixed population as in the Punjab and on the North-West Frontier, where both communities keep their women more or less in seclusion, I have often found consumption even more common amongst the Hindus than the Mussalmans, since the latter tend to have better physique and use more nourishing food.

In many cities where Mussalmans of the original conquering stock,—Pathan, Persian, Moghal,—are found alongside of " sheikh " communities consisting of those who, originally Hindus, were converted *en masse* to

Islam, it is noteworthy that the latter are the ones whose women suffer more severely from consumption.* The explanation which seems to be reasonable is that Hindus when they embraced Islam retained their "family system" of living crowded together in one house, but increased its ill-effects by adopting the purdah in addition.

Dr. H. M. Crake, Health Officer of Calcutta, states his experience regarding that city in the following terms in his Annual Report for 1913:—

"The death-rate amongst females was 39.4 per thousand as compared with 24.3 amongst males. In Ward 24 it reached the terrible figure of 48.2 per thousand. In no fewer than 6 wards it was over 40 per thousand.....These figures constitute a terrible indictment of the purdah system. Surely the women of India have a claim to demand the abolition of the custom which means premature death to so many of them. Intolerably bad as the housing conditions are in many of the slums of Calcutta, it is only when the inmates are constantly exposed to these insanitary surroundings day and night that they suffer so severely. Amongst males who can escape during the day the rate of mortality is little more than half that amongst females.

The potent influence of this custom is directly responsible for a great deal of the insanitary property in the native quarter of the city. To secure privacy, efficient lighting and ventilation are absolutely disregarded, the zenana or women's apartments being usually the most insanitary part of the house. No wonder that tuberculosis, which thrives in damp, dark, airless corners, plays havoc in the zenanas."

Speaking generally, it is not the very poor who are chiefly attacked, nor the very rich. The poor are able to go about freely in the open. They are forced to exert themselves continually, and this helps to keep them healthy. It is not the very rich, who are able to drive out or have exercise in private gardens, although even these suffer far more than those who are free from

*I found this especially mentioned of the "Borah" community in such cities as Nagpur, Ujjain, Surat, Udaipur, etc., but not in Bombay where the "Borahs" are comparatively free from purdah.

purdah restrictions. The victims of consumption belong for the most part to the lower strata of the purdah folk, those whose husbands keep them in seclusion, because it is a mark of respectability so to do, without having either the will or the ability to provide the open-air conditions under which alone such a manner of life might be compatible with a fair degree of health.

There are some centres where there is more consumption amongst men than amongst women. These are invariably places where the purdah system is not rigorously in force, and where a large number of men, whether as students or because of some other special local occupation, are living under conditions which forbid exercise, and reduce to a minimum the opportunity of being in the open air. Such men are in fact living lives comparable in this respect to those of *purdah-nashin* women and suffer accordingly.

How does such seclusion favour tuberculosis? A moment's consideration of the mutual relations between the human body and the tubercle bacillus will at once explain this. The healthy human body has the power to resist the inroads of disease to a very great extent. There are special corpuscles or cells in the blood, lymphatic glands, and other organs, which under conditions of perfect health can deal with the tubercle bacilli, destroying their vitality and their power to multiply; provided always that the dose of the living poison be not excessive. But let the exposure to infection be severe or long continued, or the resisting powers of the body weakened, and we have at once the conditions favourable to the development of the disease.

Everyone knows how exercise and fresh air brace up the muscles and give tone to the whole body, while on the other hand a sedentary occupation, with a life spent indoors tends to weaken and relax the system. A free supply of oxygen is necessary for health, and it is especially essential for those vital processes which are concerned with resistance to disease as just described. The evil effects of nights spent in closed rooms may be largely neutralized if the days bring ample opportunity for oxygenating the blood and bringing the lungs and muscles into free play; but if days as well as nights be spent in a comparatively closed space, no attempt being

made to invigorate the system, then strength fails because of such an unnatural state of things, and the body becomes vulnerable to attack; the soil is ready for the evil seed to germinate. This is what too often happens when a young girl, who has led a healthy open-air life as a child, is suddenly brought under purdah restrictions, and many are the parents who have watched and mourned over the change which results.

With all the improvements that recent years have seen, it still remains all too true that the rooms of Indian dwellings, rich as well as poor, are usually ill-ventilated, and they must in very many cases contain the germs of tuberculosis in an active form. It is by reducing to a minimum the opportunity for obtaining fresh air with its strengthening and protecting influence that the purdah system exercises its most serious effects.

I have tried as simply as possible to explain the cost from the point of view of physical health that has to be paid for the maintenance of this system; it is surely well that in balancing the advantages and disadvantages of a social custom such as this, the medical aspects of the subject should be clearly recognized.

The objections commonly urged against any proposals for change in this respect emphasize the fact that amongst the communities concerned neither men nor women are ready for relaxation of restrictions, and that freedom would lead to undesirable if not disastrous social consequences. Such considerations are in truth merely arguments—which no one would attempt to contradict—against any sudden or overrapid change. It is often forgotten that this very unfitness for freedom of intercourse is the direct result of the system itself. Concealment stimulates desire, while seclusion pauperizes the moral safeguards. If, within a family, or a community, a *gradual* relaxation of restrictions be permitted, it will be found that self-control will respond to the increasing calls made upon it, and unmeasured good with no real harm will result.

As a matter of fact in many parts of India matters in this respect are changing with great rapidity, and the opinion is often expressed, even by the most conservative, that the purdah system is doomed. All the more reason would there seem to be for the true well-wishers

of India to range themselves definitely on the side of progress, so that this age-long custom may take not centuries but only decades for its final abolition.

Whether or no any gradual relaxation in these matters be deemed practicable I would press with all possible earnestness the responsibility which rests upon every head of a family, to provide those under his care with a sufficiency of fresh air to breathe, even as he gives them food and clothing. For the man whose circumstances make it impossible for him to house his family in quarters light and airy, and with windows that may be kept open, the maintenance of strict purdah in his household is nothing short of a cruel wrong upon those whom he holds most dear.

Before leaving this subject there is one special danger which calls for a word of warning. It is as I have reason to know a common practice in some circles for the same "burqa"* to be used by various members of the one family. The "burqa" used perhaps by one daughter going to the hospital with advanced phthisis will be used immediately afterwards by another when going on an errand to the bazaar. The serious danger of infection resulting from this practice must be obvious to everyone.

*"Burqa," the white cotton garment completely enveloping head and body, which purdah ladies in Northern India commonly use when going out of doors.

CHAPTER XII.

SOCIAL CUSTOMS REGARDING WOMEN—(Contd.)

II. Child-marriage.—A social custom which is only second to the one dealt with above in its prejudicial effects upon the health of Indian women is that of child-marriage. In great tracts of the country where purdah is not observed, this is often mentioned as being the most important social factor tending towards the prevalence of consumption. The subject is one upon which the minds of very many are exercised at the present time, and there seems to be, in some provinces at least, a prospect of fresh legislation in the near future, in the direction of removing alleged legal barriers to post-puberty marriage. Almost all over India there is a gradual tendency, both among the Hindu and Mahomedan communities, towards raising the age at which marriage should usually take place.

It is not necessary here to enter into the controversies which have raged actively of late as to whether the custom rests upon a religious or a social basis, or as to its antiquity. The weight of evidence certainly seems in favour of the view that post-puberty marriage has at least the sanction of very ancient Hindu sacred writings, and also that the present practice may be described with greater accuracy as the product of long-standing custom than as that of religious ordinance. And custom may, nay *must* change with the progress of the world.

The distinction is constantly drawn between marriage and its consummation, the latter being in many communities separated by an interval of some years from the former, which is then practically equivalent to an inviolable betrothal. From the medical point of view, and therefore for our present purpose, marriage is understood as including both the ceremony and its consummation. The most serious result of separating the two in point of time is largely to increase the number of those who are the saddest of all the widows of India:

those who have never known the joys of wedlock or of motherhood.

At the larger centres visited in the course of the tour of inquiry meetings were held, as has been already mentioned, at which medical men and women, and especially Indian medical practitioners, were invited to engage in discussion upon the whole subject of the prevalence of tuberculosis and its causation.*

At some of these there were upwards of 50 medical men present, and at all, the question of child-marriage as a contributory factor in the spread of tuberculosis came up for discussion. With only one single exception it was regarded as being a most important cause of the prevalence of the disease amongst young girls. At the one meeting where a contrary view was expressed the only argument that was pressed was that early marriage is as frequent in villages as in towns, and yet consumption is far less common in the former!

Now, neither in this connection nor in that of the purdah system just discussed, is it asserted that the social custom directly *causes* tuberculosis. The direct cause of the disease is the attack of the tubercle bacillus upon the human body. But if social habits combined with domestic conditions have resulted in the almost universal presence of the germ in the houses of the people (especially in cities), then any social customs which are proved to have a deteriorating effect, definite and serious, upon the physical health of those exposed to this over-present danger, assume the importance of causative factors. In villages of course, not only is the infection far less widespread or even absent, but the inhabitants have the antidote of fresh air.

A Hindu doctor of very wide experience gave it as his opinion that in the majority of cases the first year after marriage is by no means a happy one in the life of a young wife. She has left her home and parents and the joyous freedom of childhood, and is plunged suddenly into the midst of strange surroundings, with not always very sympathetic relations-in-law. My friend believed

* Such meetings for discussion were held at Calcutta, Bombay, Madras, Lucknow, Hyderabad, Poona, Bangalore, Mysore, Agra, Delhi, Patna, and Cuttack, with smaller groups for informal discussion at Gaya, Calicut, and other centres.

that the initial time of "home sickness" and depression, frequently accompanied by moping and loss of appetite, prepared the way for consumption. And in many towns I was told of frequent cases of hysteria in newly married girls which tended to pass on to "decline" and consumption.

It is not, however, merely the evil effects of mental depression with which we have to do. A far more serious result of child-marriage lies in the exposure of the human frame while as yet immature to the physical strain that follows marriage. Everyone is aware of the consequences of sexual excess, the weakness of mind and body which results, and the extreme slowness with which restoration comes, if indeed it comes at all. Many people seem to think that such excess is only harmful if unlawful, forgetting the fearful strain upon the constitution of a delicate girl of 14 years or even less, which results from the thoughtless incontinence of the newly married boy or, still more, the pitiless incontinence of the remarried man.

Serious as these causes of strain are upon the health of the young married girl they sink into insignificance in comparison with the stress of maternity which follows. It is a truism to say that the processes connected with reproduction, which from one point of view may be regarded as the most important of human functions, should be allowed to take place under the most favourable conditions possible. Surely it would seem to be of fundamental importance that these processes should be delayed until not only the special organs concerned, but also the body as a whole, shall have attained their full development and be prepared for this great crisis. For in no other crisis of life does the ultimate result depend so much upon the physical condition of the body. In this connection we have of course to think of the nourishment of the child after birth as well as of pregnancy and child-birth. Nevertheless custom is allowed to carry the day, and to dictate that all this strain shall be deliberately imposed upon girls at a period when it is obvious that their bodies are not as yet capable of enduring it with safety.

It is of course argued that a warm climate favours precocity and that girls in India develop at an earlier age

than in more temperate climates. Let even so much as two years be conceded, and in place of 18 years, which may be reckoned as the lower limiting age in ordinary cases of marriage in the West, let 16 years be the age which popular opinion shall regard as the normal one for marriage in this country. The result would be an incalculable gain in the health of the women of India and also in that of the children whom they bear. In place of this what do we find? With thankful acknowledgment of the success which has met the efforts of those who have already done so much in this direction, 14 years is yet the upper limit of age for marriage in very many parts of India, which in multitudes of cases takes place at 13, or even 12 years.

Well were it for these children if maternity when it came were accompanied by a minimum of risk and a maximum of loving care. But, alas, the reverse is too often the case, as we shall now see.

III. The Management of Child-birth.—There is probably no country in the world where the desire for children is stronger than in India. In the home of a newly married couple it reaches a pitch of passionate longing to which those of the West are mostly strangers. To the husband it is not merely the natural parental instinct, strengthened with the wish for the continuance of the family and name, and for some one to whom his property may pass; it has with Hindus at least also a strong religious basis, founded upon the duty of the son to pay the last sacred rites to the bodies of his parents. To the wife even more than her desire for motherhood is the knowledge that only by bearing a son can she fulfil her husband's strong hopes regarding her. If she fails so to do her chance of a happy married life are small indeed. She will incur the scorn and derision of her husband's family, while in the case of Mahomedans she will have to face the possibility of a rival. When there is expectation of the first born child the minds of the whole family are set in intense anticipation upon the approaching event.

With this hope how is the child born? The subject of the conditions obtaining in India during child-birth and of the resulting appalling mortality, both of mothers and infants, is dealt with in every health officer's annual

report. The desire to remedy the present state of things inspires many of the schemes and efforts put forth by earnest-hearted women-leaders who are longing to do the best for their sex in this country.

So far as I know this matter has not hitherto been regarded as having any direct connection with the spread of consumption, nor had any such connection occurred to myself before taking up this inquiry. The evidence on the subject however which has reached me is to my mind so conclusive and so general in its extent as to force me to include it in the mention of important causative factors.

When speaking of the prevalence of the disease amongst females, the spontaneous addition has constantly been made by my informants, that it usually occurs soon after the first child is born, and doctors have many times laid emphasis upon the fact that the most acute cases, those which run a rapid course to terminate in death within three or four months, are the ones which occur within a very few months after confinement.

A description of "lying-in" conditions may be regarded as not strictly germane to the subject before us, but the importance of a realization of things as they are is so great that I propose to give in some detail information gained as a result of inquiries made in almost every part of India. There is substantial agreement as to the ordinary practice throughout the whole country, there being of course local differences as to various details.

In many of the larger cities a great change for the better is undoubtedly taking place, and I would not for a moment suggest that what I am about to describe is any longer the universal rule in the families of educated men. Even so, however, a vast proportion of the female population is frankly conservative, and in these matters a man, who himself may hold very different opinions, is usually inclined to leave things in the hands of the women of his family.

The practices which are found to exist are founded upon three sets of ideas, firstly, the religious belief that a woman at the time of child-birth is ceremonially unclean, more defiling in fact than the lowest "out-castes;" secondly, the belief that fresh air, whether warm or cold,

is dangerously harmful both for mother and child, being the usual cause of puerperal fever; and thirdly, a group of superstitious and old-fashioned theories as to medical treatment which naturally differ in various parts, but usually tend towards the extreme depression of the mother's physical strength during the "lying-in" period.

The belief that the woman at this time is unclean and a source of defilement to others determines the whole entourage of the confinement. The room chosen must not be one which is used by other members of the household, and in actual practice it is very commonly a closet or out-house with dung-plastered mud floor and walls, and the smallest possible doors and windows, which are always kept rigidly shut. In some parts of Bengal a minute booth or shelter for the purpose will be constructed of matting in the back yard. The same idea dictates that it is an absurdity to use anything clean for one who is herself unclean, and so the oldest, dirtiest, coloured rags are often used, while as a matter of ordinary fact the midwife, in place of the spotless clothing protected by the sterilized "over-all" of the West, delays to attend until she shall have exchanged her ordinary working costume for the dirty clothes suitable for the occasion, and used probably many times before without being washed.

Perhaps the hardest of all the consequences of this idea is the fact that it banishes the girl's own mother at the very time when, if ever in a lifetime, a mother's help is needed. While in some parts it is permissible for the mother to enter the room on condition of her undergoing special ceremonial cleansing afterwards, special sets of clothing being sometimes reserved for the occasion, yet in the vast majority of cases the presence of the mother is forbidden. This would matter less if the midwife was one in whom confidence might safely be placed. But this is far indeed from being the case. Dirty in habits, careless in work and often callous to suffering, bold in treatment with courage born of crass ignorance, and which causes untold mischief to her patients, the Indian "dai" belongs to a profession which, more than almost any other, is in urgent need of reform. Its very nature as things now are, limits it to women of

the lowest class,* while the fact that it is hereditary, one individual regarding it as her right to have the care of a limited group of families, removes the incentive of competition and rivalry. I have traced the course of a single woman of this sort for years amongst the respectable Hindus of a large city, her operations being continually followed by a trail of puerperal fever and death. She and those like her, would make frequent internal examinations, never using water to cleanse her hands until the end of the case.

Wonder is often expressed at the exceeding frequency of tetanus both amongst parturient women and the newly born. Why wonder, when one remembers that the tetanus bacillus has its habitat in the earth, especially in dung-containing earth? The nurse in very many places rubs her hand upon the mud-plastered floor as a cleansing process preliminary to her operations, while it is the correct procedure for delivery to take place with the patient lying not on a bedstead but on the same mud floor.

It is the second of the above-mentioned ideas which is the more closely connected with tuberculosis infection. It is an accepted canon of midwifery in India that puerperal fever results from exposure to chill, and so the most elaborate care is taken to shut out every breath of fresh air. Even in hot weather, the window and door will be tightly closed, every aperture blocked with dirty clothes, and what air remains is still further vitiated by the use of charcoal fires (in *angithis* or braziers) in the room throughout the lying-in period. This last practice is believed to have the effect of drying up discharges, but also in many places it is regarded as a means of protection from evil spirits.

The patient, during a time which varies from 6 to 13 days, has to remain—usually unbathed—in an atmosphere of almost indescribable foulness, and this when she is at the lowest possible ebb of physical strength and of power to resist disease. We may thus have, in close combination, the two factors which are nowadays being emphasized

* Usually "Chumarins," or sweeper women, although in the Punjab it is a common custom for Mahomedan women belonging to the "Kamin" classes to attend not only their own co-religionists but Hindu women also.

as contributing most strongly to tuberculosis infection, namely, a massive dose of the germ poison, coinciding with a phase of minimal resistance on the part of the patient. Need we wonder if—what I unhesitatingly affirm to be the case—a large number of young married women date the onset of an attack of consumption from the time immediately following the birth of their first child? The actual process may vary in different cases; with many it may be the arousal into activity, now that resistance is broken down, of a previously latent infection; others may become infected *de novo* from prolonged exposure to a germ-laden atmosphere. The sequel is the same, and the disease contracted under such circumstances usually progresses with rapidity to a fatal issue.

Further, as if to ensure that nothing should be wanting to try the constitution of the patient to the uttermost, she has to undergo during these early days a diet regime of the greatest severity. Milk in any form, and in fact almost every kind of really nourishing food, is forbidden during the first few days. Water is given very sparingly; in South India it is usually withheld entirely during the first 24 hours as being liable to cause chill, but bitter drugs and hot condiments are given freely. In Rajputana if the child dies, the proper diet for the mother during the first three days is said to be a decoction of copper coins and bamboo, while rice and pepper water seem to be regarded in many places as being the best general diet! The details naturally differ in various parts, but almost always agree in the one principle so utterly at variance with the established practice of modern obstetrics, that of keeping the patient on a lowering diet during the whole of the lying-in period. All this is a poor preparation for the further drain of lactation, the long prolongation of which adds still more to the series of heavy calls upon the strength of the young wife.

It is a commonplace of medicine that pregnancy and child-bearing, even under the best conditions possible, are a serious complication of early tubercle, frequently causing the disease to take on a more severe and acute form; what wonder if this result should still more frequently follow conditions such as have been described above, or that the disease of consumption, previously

existing in a wholly latent and undiscovered form, should after such treatment suddenly light up into activity.

It is easy to point out what appear to be mistaken practices; to suggest remedies is a far harder task. Part of what has been mentioned above, the popular prejudice against fresh air, the mistaken views regarding diet, the general carelessness as to septicity, only need the spread of knowledge for their remedy. This, though slow, is possible, is in fact proceeding steadily on all hands. With regard to other matters, however, which so urgently seem to call for reform, we are up against far greater difficulties, and in making any suggestions I would tread with the greatest caution.

I could not personally press any Indian friend to make any change in practice which to him or her would offend against religious law and conscience. For the mother then who regards her daughter as for the time unclean I would not dare to press any closeness of intercourse which religion may forbid. Surely, however, it may be urged that the fact of ceremonial uncleanness does not carry with it any obligation to render defilement worse defiled. There is no *necessity* to have the room, the clothing, and the person of the midwife all so dirty as to be sources of infection and danger. The religious belief may be held to excuse carelessness as regards cleanliness as of secondary importance, but it does not command it, and where the life both of mother and child is in the balance, surely it were well to follow what is now so clearly proved to be the path of safety.

So even to one who holds the strictly orthodox position I would say, choose the room beforehand and have it carefully cleared out, cleansed, replastered and whitewashed. If the floor is a mud-plastered one, have it covered with a clean cotton sheet. If possible provide a set of new clothes for the "dai," or in any case have a clean apron or "over-all" for her to wear over her own clothes, and insist on her making free use of soap and water. If circumstances permit, prepare clean washable clothing for the patient to wear both during labour and subsequently. Furthermore it will be found that, especially when the apartment is small, the use of hot-water bottles in places of charcoal fires is a much more healthy mode of securing warmth, since these do not

produce poisonous gases in the room, and also that if the patient is kept supplied with a sufficiency of bed-clothes, *there is safety and no danger in having the window open to the fresh air.* In none of the above suggestions can there be any possible offence against religious belief.

There are many who feel that any movement to substitute modern Western methods for those which have been sanctioned by immemorial usage in the East shows a lack of patriotic feeling, and the dictum that "Indian ways are best for India" is frequently uttered and accepted without question. I would earnestly beg my readers to make a careful study of the local statistics referring to these matters, and after thus putting the question to the test decide whether or no Indian methods in this respect have indeed proved a success.

A few typical statistics will illustrate my meaning. In England and Wales the deaths of women attributed to pregnancy or child-birth amounted in 1917 to 2,598 (*i.e.*, 3.89 per thousand child-births).

In Delhi there were in 1914, 136 deaths directly attributed to causes connected with child-birth. With a total of 10,762 this gives a death-rate of 12.6 per thousand births.

At one small town of 5,000 inhabitants in Northern India, the dais and local doctor between them gave to a medical friend the actual names of no less than twelve women who had died from sepsis after child-birth in a single month.

Can Indian mothers claim that their methods are satisfactory with regard to newly-born infants? Sir George Newman, the Chief Medical Officer of the recently established Ministry of Health in England, says that "the death-rate of infants is the most sensitive index we possess of physical welfare and of the effect of sanitary Government." By the infant mortality rate we mean the number of infants out of every 1,000 born who die in their first year of life. Fifty years ago this rate in England was 162. It has now fallen as a result of improved sanitation and more careful supervision of the conditions of child-birth, etc., until in 1917 it was only 96. In many of the large towns in England the infant death-rate last year was below 70 and in some of the smaller towns even below 50. In contrast with this

we find from the official statistics of Indian cities that there is scarcely a large town in which the infant mortality rate is not higher than 200 and in many of the largest towns it is more than 400.

The following are fairly typical:—

Town.	Year.	Infantile death-rate.	Remarks.
Bombay ...	1917	304·25	Corrected rates.
	1918	436·37	
Mandalay ...	1915	449·2	
	1916	443·3	
Delhi ...	1913	346·4	Steady annual decrease.
	1917	256·24	
Benares ...	1913	276·27	Lowest for 20 years.
Karachi ...	1915	256·0	
Madras ...	1918	360·7	
Rangoon ...	1916	288·01	

Inquiry at Rangoon shewed that in 1916, amongst infants attended at their birth by midwives of the local Society for prevention of Infantile mortality, the rate was only 106.5.

The prodigious amount of preventable suffering and sorrow which such figures represent, can only be dimly imagined.

The results of two further actual inquiries may be added:—

The following questions were put one morning to the first 50 married women attending the out-door dispensary of the Lady Dufferin's Hospital at Karachi:—

(1) How many pregnancies have you had?

(2) How many of the children are now alive?

The total number of pregnancies amongst the 50 was 241 and the number of children surviving only 120.*

In Delhi two ladies engaged in domestic maternity nursing work in the City, were asked by myself to inquire from mothers in 1,000 consecutive cases to which they were called, (where it was not the first confinement), whether the first-born was still alive. The result obtained was that out of the 1,000 women, 657 had lost their first-born child.

In what has been said above, attention will seem to have been concentrated upon the case of those of a fairly comfortable social position, and especially of those living in cities. The only hope of bringing about a real change

*Prize Essay by Miss D. F. Curjel, M.D., W.M.S.

in the conditions obtaining amongst the very poor is by first making them popular amongst those of a higher social level, while as regards patients in villages the more healthy open life of the women tends to a great extent to counteract the errors as to their treatment.

The efforts of those who have attempted to deal with these problems have naturally been concentrated upon the question of giving a better training to midwives. In many centres excellent work has been done in this direction; if the indigenous "dai" can be induced to accept training while still young, before contrary habits have become engrained, very great improvement may and does result, but the common verdict is that as a rule the attempt to change the practice and habits of the hereditary midwife is not encouraging. She tends, if left to herself, to revert to the old ways dear both to herself and to the older women amongst her clientèle.

It is of course different where city dais can be retained in permanent relation with lady doctors, under whose supervision they work. This arrangement, which obtains in connection with many Zenana Mission Hospitals, is most valuable in every way. But the real remedy goes deeper than this. All efforts to train the present class of dais, fail to give promise of *permanent* reform.* At the Lucknow Sanitary Conference of 1914 an interesting paper was presented by the "Association of Medical Women in India" containing proposals for the formation of a "Women's Domestic Sanitary Service for India." It described the untold benefits which would result from the organization on a large scale of a service of domestic nurses under trained supervision, who could give both practical teaching in sanitary matters and also actual assistance in the homes of the people themselves. This again is wholly excellent, and yet as things at present stand in India there is a fatal flaw in the scheme.

*This statement may appear too sweeping to some. The efforts made in regard to the training of dais and especially in educating the children of hereditary midwives in preparation for their future calling, are worthy of all praise, and, in view of the long period which must elapse before a different class of nurse attains popularity, are of real practical importance. But the true and permanent remedy lies deeper.

At several public discussions it has been said "What we need is that Government should provide more trained midwives." And my reply has been "True, but it is for you to first provide the raw material, and then Government will see to the training." The real difficulty which confronts anyone who aims at the improvement of domestic nursing in India, is that *as yet we have not the right women for the work.* The "Sarah Gamp" of Charles Dickens was the representative, in England of 70 years ago, of the Indian dai of to-day, and the nursing profession in England did not begin to be really reformed until Florence Nightingale and her noble followers showed that it was an honourable calling, one to which any high-born woman might be proud to devote herself. Is it too much to hope that gradually public opinion will so change, that it may be possible for thousands of respectable widows, Brahmins, Kshatriyas, Mahomedans and others, to find in self-sacrificing service of their sisters, each in her own special community, the truest joy and satisfaction in life?

Well do I know that the old difficulty, the danger of ceremonial contamination inherent in the duties of the nurse, comes again to the fore. What was done in the case of railway travelling, with its inevitable risks of such contamination? What was done when the number of men who sought education "beyond the seas," and who refused to undergo full ceremonial rehabilitation on their return, became so large that the Hindu community could no longer afford to exclude them? It was found that the Shahstras were not so rigid, not so impossible of adaptation to changing circumstances as had been supposed, and that a course of action which at first was thought to involve ceremonial exclusion, might be condoned under the pressure of social necessity.

My contention is that the salvation of the lives of thousands upon thousands of mothers and children, the preservation of the happiness of Indian homes, is of greater moment even than the retention within the fold of orthodoxy of the hundreds or thousands who go abroad. Are not the vital interests at stake sufficient to enable a Brahmin lady to assist her suffering sister without—cleansed as only a trained nurse knows how to cleanse herself—thereby losing her status and caste? This is

the problem, and when once it has been settled, it will be found that a new race of nurses will arise, women who serve with love as their motive, and with a sympathetic care of which the present hereditary dai knows nothing. It will provide an honourable means of livelihood for a multitude of women who are now a burden upon home finances, and it will remove from India this great reproach upon her domestic life.

A Brahmin lady who was courageous enough to seek training as a nurse with a view to helping others went to her village on leave. At first she was scorned by her friends, but it was not long before they found her assistance so invaluable that all their opposition died away. The term "dai" would of course never be used to describe such nurses of a superior social grade, just as in England the "monthly nurse" or "maternity nurse" is never now called a midwife.

It must not be imagined that as yet there is any clamant demand for a new class of domestic nurses. In many centres where the experiment has been tried of employing trained nurses, there has been an initial period during which little demand for their services has been shewn. The attitude of the older women especially is usually strongly conservative, with a decided suspicion of "English methods," and in this they are of course backed up by the existing hereditary dai who fears that her occupation may be in danger. A further reason for reluctance to employ the modern trained nurse may be found in the fact that they expect higher fees and are often unwilling to stay and do menial work in the house, as the dai is expected to do, for several days after the confinement.

Speaking generally, the only Indian women of respectable position who are not prevented by caste or religion from acting as maternity nurses or midwives are the Christians, and these are in many cities doing most excellent work. The number of these is, however, so small that their existence does not in any way affect the urgency of the need for the larger supply of nurses from Hindu and Mahomedan sources. Specially valuable, both in themselves, and as a means of spreading knowledge amongst the women, are the maternity hospitals which have been established in Bombay, Calcutta,

Madras, Hyderabad and some other cities, and the maternity wards of many Dufferin and mission hospitals.

I know there are difficulties in the way of any widespread extension of trained domestic nursing; moral temptations which will need to be guarded against, opposition in many quarters to be overcome, but once a real start is made such a movement is bound to grow and increase. In some centres a beginning has been made. At Calcutta a scheme has been established for the training of "caste women" for this very purpose. A few are already in training and they give every promise of future usefulness. In other places Associations have been formed with the object of spreading amongst Indian ladies the ideals of social service and especially also of giving to widows the assistance and training which they need in order to enable them to be of more use to those of their own sex. Chief amongst these may be mentioned the excellent "Sewa Sadan" Society at Poona under Mrs. Ranade, and the similar organization at Bombay.

It is a common fallacy to throw upon the women all the blame for the hygienic defects in Indian homes. This is, in my opinion, wholly unjust. It is a truism to say that knowledge involves responsibility; how can the college student who has learned the elements of science or hygiene, or at least is conversant with the scrupulous care as regards cleanliness taken in a hospital operating room; how can he escape the duty of insisting upon some such care in his own home, where at the time of childbirth the need for asepsis is equally great. Surely this amount of "Home rule" should be demanded by the master of the house as his right!

A short time ago I took a course of simple lessons in maternity nursing methods for a group of about 20 dais in a small town. Afterwards the Pathan orderly who had been on duty where the lectures were held came to me to announce the birth of his first-born son, adding with pride that he had listened at the door to my teaching, had cleansed and whitewashed his house before the event, and had warned the nurse that unless she washed herself and did all that the doctor sahib had said, she would not get any pay! That is what Indian homes need to-day from their masters!

One other point of importance. Maternity nursing will not be improved until Indians are prepared to pay a proper price for it. All over the country the most ordinary fee for the midwife amongst the middle classes is One Rupee with perhaps a few old clothes, and this includes not only attendance at the confinement, but also menial and often degrading service during several days afterwards. Amongst the poor, 4 annas is a common fee if the child is a boy, 2 as. for a girl! In this world the quality of goods obtained usually depends upon the price paid, and the Indian of to-day pays on his wife's account the price of utter inefficiency and gets it! Let him deny himself and insist on cleanliness, experience and efficiency here at all events, even if he has to pay a higher price for it, and employ a sweeper woman in addition. He will have his rich reward in health and happiness in the home afterwards.

The Maternity and Child Welfare Association recently established at Delhi by Her Excellency, Lady Chelmsford, and the similar organizations now being started at Calcutta and Bombay, give promise of very great usefulness. It will however, be only in proportion as they secure the active co-operation of the Indian public that they can hope to achieve real success. It is not enough for an Indian gentleman to give generous subscriptions to movements such as these; he will double the value of his gift if he will make a personal study of the problems at issue, and range himself openly, both in his public and private relationships, on the side of progress.

It may perhaps be objected that the connection of tuberculosis with these different social customs relating to women is not so close as to justify the amount of space which has been devoted to them in this chapter. I would only reply that in my opinion the connection is both intimate and of the greatest importance. It was only in the course of my search for the causal factors of tuberculosis that I was compelled to recognise the real seriousness from the health standpoint of these various customs, and I suggest that here we have a typical instance of the fact—mentioned in the introductory chapter —that the incidence of tuberculosis is one of Nature's danger signals pointing out errors against her inexorable laws of health.

CHAPTER XIII.

HABITS TENDING TOWARDS THE SPREAD OF CONSUMPTION.

Apart from the above mentioned social customs which can hardly be changed without a gradual alteration of public opinion, there are certain habits which are of great importance as causative factors and which a wide diffusion of knowledge ought to do much to correct.

1. Spitting.—Foremost amongst the habits which conduce to the spread of tuberculosis must be placed that of indiscriminate spitting. Bearing in mind that—as has already been explained—bovine tuberculosis is not of importance as a cause of the human disease in India, we may for practical purposes conclude that the only source of tubercle infection is in the lungs of consumptive people. The discharges from wounds in cases of surgical tuberculosis do not contain the organisms in such quantities as to constitute them a serious source of danger, nor again is there any evidence to shew that infection occurs on any large scale as a result of fæcal contamination of food or water.

The commonest way in which the tubercle bacillus is disseminated is without doubt through the expectoration of those afflicted with the disease. A distinction is to be drawn between the "closed" cases of tubercle of the lung, in which while local inflammatory foci are present, yet the "tubercles" have not yet broken down into abscesses; and the "open" cases, in which these tuberculous abscesses have formed and have opened into the air passages, thus providing a communication between the abscess cavity in the lung, crowded with the living germs, and the outside air. In the "closed" cases there is often no cough at all, or a dry cough with little expectoration, and no tubercle bacilli in the sputum, and therefore *no danger of infection to others*. In the "open" cases there is cough often with profuse expectoration, which may contain enormous numbers of bacilli. It has been estimated that a patient suffering in this way may void as many as four thousand millions of the living organisms in a single day.

It should of course be remembered that a "closed" case, although at the time not an actual source of danger, must nevertheless be considered as a potential one, since the disease may at any time progress into the more active stage. This fact emphasizes the great importance of training cases of even quite early phthisis into careful habits as regards the disposal of their sputum, and as to the necessity of avoiding altogether the habit of indiscriminate spitting.

The danger to others comes either from the sputum which dries on walls, floor, furniture, etc., when the bacilli become distributed in the dust, or else from the minute droplets discharged into the air by those who are not careful to protect the mouth during coughing. In either case the danger can be easily avoided by due care. From what has been said above (see page 120), as to the action of sunlight upon the tubercle bacillus, it is clear that the risk of spitting in the open air is comparatively slight, especially since the limitless volume of air dilutes whatever poison may be present beyond the point of dangerous concentration.

It is to the evil habit of indiscriminate spitting *indoors* that the spread of tuberculosis in India (as in other countries) is in large measure due. The various other social factors which have been already mentioned would lose most of their significance—so far as this disease is concerned—if once the habit of spitting could be abolished. These other factors act in conjunction with the "spitting habit" by:—

(*a*) Providing, as in dark, dirty rooms with defective ventilation, conditions under which the germs may retain their vitality.

(*b*) Preparing a suitable soil in which the germ may develop, *i.e.*, the human body whose powers of resistance to disease have been diminished.

(*c*) Bringing into close contact with each other large numbers of persons, some of whom may be "seed-producers" and others "soil-prepared."

There is a wide difference between various races in India, and between similar communities in different parts of the country, as regards the prevalence of the habit of indiscriminate spitting. Generally speaking the Mahomedans are much worse offenders than the

Hindus in this respect; probably none could be worse than the Pathans of the North-West Frontier. It is a common thing to see the colour of the walls around the bed of a phthisical patient completely changed as a consequence of the continual expectoration upon it. The habits both of smoking tobacco and of eating "pan" (betel), whether or no harmful in themselves, undoubtedly encourage spitting to a large extent. In some parts a respectable Hindu would be ashamed to spit within his dwelling, but speaking generally such carefulness is rather the exception than the rule, and in most parts of India there is great carelessness in this respect amongst all grades and classes.

With the gradual diffusion of education regarding the spread of disease it may be hoped that this filthy habit will gradually be banished at least from polite society. It may be doubted, however, whether this will take place until the use of the pocket handkerchief becomes popularized. The present extremely common practice amongst the poorer classes of using, as a substitute for the latter, some part of the clothing, the loose end of the turban, the lappet of the shirt, the chaddar, or even the burqa, is both objectionable and obviously attended with risk of infection to others.

It may be well to add a brief note as to the disposal of the sputum of those who are actually suffering from consumption. The consumptive person *must* spit; for him to swallow the discharges from his lungs, heavily charged as they may be with tubercle bacilli, would mean to run the risk of adding intestinal infection to his lung trouble. But there is no difficulty in so arranging matters as to avoid all risk of spread of infection to others.

In-doors, the easiest thing is to use a spittoon, or failing this any sort of open vessel. In this there should be fluid of some kind, carbolic lotion (1 part in 20 of water), izal (1 part in 50 of water) or any other of the numerous disinfectants in ordinary use. Plain water will do quite well so long as the receptacle is cleaned out carefully every day with boiling water. In the cold weather, if a charcoal fire in a brazier or *angithi* be burning in the room, it is perfectly safe for the patient to spit upon this, since the germs are thus instantly

destroyed. An almost equally satisfactory plan is for the patient to use a small tray of ashes which may be emptied upon the fire from time to time.

For out-door use the objection felt by many to retain anything containing sputum upon the person adds somewhat to the difficulty. The choice would seem to lie between the use of one of the many varieties of pocket "flask spittoon," or of small pieces of rag or paper which may be kept in a convenient receptacle and burnt upon the first opportunity.*

Simple precautions such as these for the disposal of sputum, combined with provision for an abundant supply of fresh air around the patient and care regarding contamination of food, will suffice to eliminate practically all danger of infection.

2. The "Foul Air Habit."—I have used this epithet to describe the habit of life, almost universal as yet in India, which in Western countries is being so largely replaced by the "fresh air habit." I mean the gradually acquired tolerance of, or even preference for, an atmosphere charged with the products of human combustion, air which has already been breathed. It would probably be more correct to say that this preference is for *stagnant* rather than impure air. But the result is practically the same, since air which is confined in a space and is respired again and again without being renewed very quickly becomes impure.

The main reason why in the first instance stagnant air is preferred to that in active circulation is because of the sensation of greater warmth and comfort which it gives. Not only does moving air feel chilly because of its action in conducting heat from the body-surface, but the still air in a room is actually warmed both by contact with its walls and furniture, and also by being respired. In cold climates such as that of the Punjab in winter, it has become the custom to live, and still more to sleep, in dwellings closed from the outside air, and there can

* Various forms of receptacle for sputum, including pocket "flask spittoons," special envelopes to contain used and unused squares of paper, etc., are on view at the headquarters of the King George V. Anti-Tuberculosis League, Bombay, whence they may be obtained on payment. The same are also stocked by most chemists.

be no doubt that this is one main cause of the greater prevalence of tuberculosis throughout the north of India.

In proportion as mankind has made artificial arrangements by providing himself with dwelling houses and clothing to escape from the rigours of climate, so he has gradually lost to a large extent his original power of adaptation, and has become more and more sensitive to changes of temperature. Whilst, owing to this acquired sensitiveness and vulnerability to chill it would be a doubtful kindness to suddenly enforce an open-air regime in cold weather upon people unable to afford fuel or extra clothing, yet there is no doubt that the provision of open air conditions largely and rapidly increases the power to withstand cold.

The prejudice against fresh air is due to the oft-experienced chilling effect of a stream of cold air, *i.e.*, a "draught," upon the body when heated, or in a chamber otherwise filled with air at a higher temperature. In this case the sudden contrast of temperature chills the body or a portion of it, and lessens vitality, thus rendering it for the time more susceptible to attack by the germs of diseases such as those of catarrh or pneumonia. If instead of a chilling draught, caused perhaps by the narrow chink of one window being left open, we substitute a flood of fresh air by opening widely windows and doors, especially if it has been possible to stimulate the circulation by active exercise beforehand, we place ourselves under conditions infinitely more hygienic, and this without running any risk from chill. Further, if we make it our practice to avoid "draught," not by closing the orifices which admit them, but by opening our room to the more generous access of fresh air, we shall soon find by experience that our powers of resistance to cold are increasing and we shall feel less and less the need of fires and warm clothing.

A closely parallel state of things obtains in the case of excessive heat. It has been far too much the custom in India, both amongst Europeans and Indians, to rely for comfort upon an artificial reduction of temperature by carefully excluding the warm outside air. Although combined with the use of punkahs a comfortable sense of coolness may be thus obtained, yet it is at the expense of hygienic conditions, for the atmosphere towards the

close of the day becomes often foul in the extreme. If on the other hand doors and windows be kept widely open, the increase of temperature will be more than compensated for by the increased body resistance to heat and the general sense of well-being. In Peshawar, where the temperature rises to 118 degrees in the shade in summer, I have found it far more easy to dispense with punkahs without serious inconvenience or discomfort when, except during severe dust storms, I have kept the house freely open during the day and have slept out of doors.

Although amongst the poorer inhabitants of India, those who cannot afford punkahs, it would probably not be correct in the case of the excessive heat to say that there is an actual preference for stagnant air, yet their tolerance of it is certainly extraordinary and is on a par with their tolerance of other harmful conditions. In South India where the climate is such as to favour sleeping out all the year round, one was constantly told that the women did not dare to do so, but usually slept with doors and windows closed, for fear of robbers who are often on the watch to snatch away jewellery and ornaments from the persons of those sleeping. The fear of evil spirits also in many parts of India drives people under cover. Thus considerations of privacy, or of safety, or of superstitious belief, keep millions of people sleeping in an impure stagnant atmosphere, who otherwise might be enjoying the pure fresh air outside. There are very many cases where the provision of a light upper story for the female members of a household would be a perfectly practicable and satisfactory solution of such difficulties.

3. Sleeping with the Face covered.—This almost universal habit is really included under the preceding one, but is mentioned separately for the sake of greater emphasis. There can be no shadow of doubt that this practice is very prejudicial to health, and that it is responsible for much imperfect aeration of the blood, preparing the way for the successful attack of the ever-present germs of tuberculosis. For, at least in the cold of Northern India, it is not a matter merely of covering the head with a thin sheet of cotton or muslin through which the air may freely pass, but the head and face are

closely enveloped in the same thick blankets or quilt which are used for the covering of the whole body, as if the breathing apparatus had no rights at all for consideration! This must result in the breathing again and again through the night of the same air fouled with carbonic acid gas and other effete matters thrown off from the body during respiration.

The possibilities for danger which this habit holds are intensified in certain communities, *e.g.*, the Pathans of the North-West Border and the aborigines of Chota Nagpur, where husband and wife, and even children also, will often sleep together all under the same large quilt or mat.

The habit and its remedy will be touched upon again in dealing with boarding schools; it may be said that when once a person has broken the habit, the sense of freedom and of greater refreshment from sleep prevents him from ever returning to it. The remedy to be successful must of course take account of the underlying cause, which varies in different places and with different individuals. In some parts the habit has grown entirely as a means of protection against cold, owing to the undoubted sense of warmth which results from the protection of the head, and the utilization of the heated breath as a hot air warming apparatus for the body! Of these two supposed advantages, the first can at once be provided for by arrangements to protect the head, while leaving the mouth and nose uncovered (*e.g.*, by a "Balaclava" cap, or by having the blanket made to button below the chin), but the second is unhygienic and must be altogether condemned.

In many parts the practice has grown as the simplest and cheapest protection against the mosquito pest. This calls for alternative measures for protection, whether by netting, wire gauze, or "anti-mosquito" applications. We must not escape from consumption at the risk of being infected with malaria. For those who cover the head for fear of evil spirits, or because of the fictitious sense of security which the covered head imparts, education must be the remedy.

4. Carelessness regarding Food.—From much that has already been written it might be assumed that the normal path of infection in the case of tuberculosis is

by means of the breath direct to the air-passages and lungs. There is, however, strong reason to believe that, far more generally than is usually supposed, the germs enter the body not *via* the lungs with the breath, but through the lining membranes of the throat and other parts of the alimentary tract. This is believed to be specially the case as regards the various distressing forms of surgical tuberculosis, as, for instance, tuberculous ulceration of the intestines, the so-called "scrofulous" glands in the neck, abdomen or elsewhere, and tuberculous disease of bones and joints.

It is obvious that tubercle bacilli must often be present upon the lips of a person suffering from advanced consumption, and that therefore, there is a risk of infection passing to anyone else who uses the same vessel for food or drink after such a patient, without taking care to have it first properly cleansed. Such direct infection is less likely to occur when, as is usual amongst Hindus, the lips do not actually touch the vessel, fingers are used instead of spoons or forks, and water is poured out into the hand and so into the mouth. Amongst Mahomedans, however, it is the almost universal practice for a family to eat and drink from the same vessels, whilst with vast numbers of Hindus, not to speak of other communities lower in the social scale, very much laxity on this point is permitted. Almost everywhere it is customary for the wife (and also daughters) to eat from what remains after the husband and sons have fed, *and from the same vessels.*

Without suggesting for a moment the advisability of any change in the ordinary customs as regards feeding, it must be strongly emphasized as part of the precautionary measures needed to enable a case of advanced consumption to live with any safety in the same home with others, that it is of the greatest importance that he should have entirely separate vessels for food and drink, and that these should be carefully cleansed after use. The leaf plates so widely used in many parts of India, are an example of a cheap and indigenous, but perfectly satisfactory method of solving the problem of separate food vessels.

Amongst some educated people in the cities there is already a tendency towards taking this precaution, and

in fact the trouble and expense involved in having separate vessels is one of the reasons which sometimes induce parents of prospective brides or bridegrooms who may be affected with enlarged glands, to bring them for operation, in order to avoid the further disease which as they know by experience often follows as a sequel. On the other hand the question addressed to an Indian lady, as to whether or not a Hindu wife would usually continue to eat from the same vessels after her husband, if he became consumptive, brought the reply, "Why not? Why should *she* care about living if *he* had a fatal disease?"

What has been said above regarding the use of vessels for food and drink applies at least with equal force to the use of a common *huqqa*. In many places it is a usual custom, especially amongst Mahomedans, for shopmen to keep a *huqqa* ready for all who come or pass by, and who are welcome to indulge themselves at the cost of one pice.

Dr. C. A. Bentley, Sanitary Commissioner of Bengal, mentions that the use of the common *huqqa*, in a general sitting room or *baitakkhana*, has been noticed by him amongst Mussalmans in Bengal villages, and gives the instance of one small village, in which the headman was suffering from advanced phthisis, and there was a case of phthisis (in each case an adult male aged over 40) in every one of six adjacent houses. These men used to meet together each evening in the headman's house to smoke and talk. The danger of infection from such a practice is by no means confined to the one disease of tuberculosis, and although it may seem hard to discourage what has such obvious conveniences, yet it may at least be strongly urged that persons suffering from consumption should exercise the self-restraint which will prevent them sharing the same *huqqa* with others.

It is, however, by no means only in regard to vessels for drink and food that the need for precautions against alimentary infection must be enjoined. There is in all parts of the country, and in almost every community, a degree of carelessness regarding the food itself which must be responsible for a vast amount of preventible disease. The ceremonial with which the orthodox Hindu prepares his food doubtless safeguards him to some

extent as compared with those who are less particular, and on the whole the food prepared for Mussalmans usually seems to be far less carefully protected than that for Hindus. Almost everywhere, however, the opportunities of infection either from dust, or from that pestilential carrier of disease, the common house fly, are all too evident.

It has been pointed out above (see page 98), that milk, considered as a medium for conveying the disease from the cow to the human being, is not in India a common cause of tuberculosis. Milk may be, however, and doubtless often is, infected by flies or dust after it has been boiled and while standing in open vessels to cool. The very use of the fingers as mentioned above to convey food to the mouth, if it is to be free from risk, must presuppose the invariable cleansing of them before as well as after the meal.

In all these matters our chief enemy is the dust, which in the narrow streets of a crowded city, in railway carriages and other conveyances, and in the homes of those whose families number a consumptive amongst their members, must always contain tubercle bacilli. It is better to face facts, and recognize that in a crowded city it is utterly impossible to avoid exposure to infection; yet common sense should teach us the importance of keeping not only our houses but their atmosphere as clean as possible. The absolute callousness of the Indian sweeper in raising clouds of dust as the natural accompaniment of his operations is not only responsible for the very considerable amount of tuberculosis amongst this special class, but also doubtless for spreading infection amongst others.

It may be well to mention a few of the ways in which this ever-present dust may be habitually conveyed to the mouth, as giving some indication of the directions in which care, whether as regards one's own personal habits or the training of those of little children, may wisely be exercised. Commonest probably of all the causes of the tuberculous or "scrofulous" glands in the necks of young children, the "giltiañ" of Northern India, is the fact that they are continually allowed to crawl about on the bare floor, often of course putting their fingers grimed with dust into their mouths. This

it may be impossible to prevent, and efforts should be directed rather towards eliminating the source of infection, the spitting, as well as the dust which may contain the germs. It is, however, more possible to prevent children from putting sundry articles into their mouths, from sucking their pencils, using saliva to clean their slates, passing the same piece of fruit or sweetmeat from one to another and the like. As an example of personal habits amongst older people which can hardly be regarded as free from risk may be mentioned that of continually wetting the finger with saliva in counting bank notes or in turning over the pages of books in offices, especially where these are fingered by various workers.

5. Intemperance in the use of Alcohol and Drugs, and Sexual Excess.—There can be no doubt whatever that intemperance in the use of alcoholic liquors, as well as of hemp derivatives and other drugs, is a potent factor in preparing the ground for tuberculosis infection. Both in my own hospital practice and from the information given me by many others I have had abundant evidence of the number of cases in which consumption follows as a sequel to loss of strength of constitution through indulgence in drink or drugs. Amongst many of those who already live and work in an unfavourable environment, such for instance as the "darzis," of whom mention will shortly be made (see page 180), the addition of drunkenness in the case of the bread-winner means not only an enfeebled frame for himself, but less food and more squalor for those who are dependent upon him.

In the jails of Burma the large proportion of opium eaters and smokers amongst the patients in the tuberculosis wards was a constantly noted feature.

The habit of taking cocaine in "pán" (or betel) is increasing to a serious extent throughout India in spite of all efforts to limit its consumption. Although no details as to its effects are available, yet there can be little doubt that this habit, tending as it does to progressive physical deterioration, will before long become well recognised as a predisposing cause of phthisis.

All who have come into close contact with young men in the larger cities, whether as doctors or

educationalists, will have had painful experience of the frequency with which consumption supervenes in those whose constitutions have been enfeebled as a result of sexual excess.

6. Unwise Fashions in Clothing.—If, as will be mentioned later, the darzis suffer more than others from phthisis, they are themselves not without blame in helping to predispose their fellow-countrymen to the disease. The village dwellers of India, even when the cold obliges them to dress warmly, affect a delightfully loose and easy style of costume. But very many of those whose homes are in the cities, and who are dependent upon the Indian tailor for their clothes, are compelled by "fashion" to wear clothes which tend to contract the chest, preventing to a dangerous extent the full expansion of the lungs. Every mistress knows that when she orders uniform for her servants, the darzi will, unless specially warned to the contrary, make the garment so that it fastens too tightly across the chest, while the results of this harmful fashion may be seen in the slim figure with drooping shoulders and narrow hollow chest of many a well-dressed Delhi or Rajput Mussalman. The tightness of the waist-coats, the "cholis" or other chest under-garments as used by girls in many parts of India, has been frequently commented upon by lady doctors and schoolmistresses. The emancipation which the English or American girl has obtained in this respect as compared with the fashion of 20 years ago, when "tight lacing" restrained the movements of the lungs even more than anything now seen in this country, may well encourage those responsible for Indian fashions to set the example of more rational attire where this is needed.

Another widespread and harmful custom as regards clothing consists in the wearing in the colder parts of India of far too much under-clothing. This custom is especially noticeable amongst those who are supposed to be inclined towards consumption, because of the exaggerated fear of chill commonly left on their behalf. It is no uncommon thing on asking a delicate young man to strip for examination, to see successively removed, first a heavy overcoat and scarf, then an under-coat, then a thick quilted outer waist-coat with an ordinary one beneath it, and then a "kurta" (shirt), and perhaps

two vests, one of them of thick woollen fabric, and beneath all a woollen "chest protector." The wearing of an excessive amount of heavy woollen clothing, although it gives undoubtedly a sense of comfort and warmth, encourages excessive perspiration, while preventing the evaporation of the body-moisture. It limits muscular exercise when this would be otherwise advantageous, and generally tends towards an inactive habit of life, and a more or less sluggish condition of the circulation.

The error is on the same lines with that already mentioned under the heading "the foul air habit." The wrong way to keep warm is to shut out the fresh air from the surface of the body and from the lungs, depending for warmth upon artificial means, heated rooms, heavy clothing and the like. The true and healthy way is to live as much as possible in the fresh air, not only breathing it but letting it have free access to all parts of the body. This last will be the case in proportion as the clothing is light and porous in texture, and the same properties will enable that free evaporation to take place from the body surface which is such an important condition of health.

It will be found at once by experience that the body will respond to this fresh air environment by an increase in the activity of the circulation, which in turn will greatly lessen the feeling of chilliness and therefore the need for heavy clothing. In all cases where in the absence of fever, physical exercise is permissible, this of course still further increases the activity of the circulation and lessens the need for overwarm clothing. The danger of chill, from exposure when the surface of the body is heated after active exercise, must of course be guarded against by the use of additional wraps.

CHAPTER XIV.

OTHER ECONOMIC AND SOCIAL FACTORS.

1. The Rise in the Price of Food.—We have already considered poverty in relation to overcrowding as a contributory cause of phthisis. Malnutrition, whether from insufficient or from unsuitable food, is also a most important predisposing condition, and in the cities, the steady and marked rise in the price of foodstuffs has in multitude of cases resulted in a gradual semi-starvation, or in such a degree of insufficient feeding as must tend greatly to lower the powers of resistance against disease. Administrative effort has to a great extent lessened the possibility of widespread famines, but there is always a considerable percentage of the population in a condition of extreme poverty, and for these, the great increase in prices of the last few years, has led in many cases to inevitable and serious underfeeding.

The effects of scarcity as regards cereals may probably find expression mostly upon the digestive system, but with reference to our present subject it is the scanty supply and raised price of *milk* that calls for more attention. In the cities of Northern India, where for some months of the year there is severe cold, milk and its derivatives, especially clarified butter or "ghi," form a very important part of the natural food of the people. Years ago when there was not so much congestion of population, it was the regular custom in many cities for a middle class family to keep a cow. It is now quite the exception for this to be done; space is more limited, fodder expensive, and the rise in the price of wheat and other grains leaves less margin for milk. The cows kept by regular "gowalas" are gradually and rightly being expelled from within city boundaries, but the machinery for the distribution of milk from a distance is as yet most unsatisfactory. It is retailed in small, usually dirty bazaar shops, where the possibilities of infection are great and the certainties of adulteration greater. In many cities the price of milk and "ghi" has risen more than fourfold during the last 20 years.

It is satisfactory to know that in many cities efforts in the direction of a co-operative milk supply are already in progress and in some cases have passed the experimental stage. The fact remains nevertheless, that in most of the larger towns it is impossible for the poor to obtain milk in other than a greatly adulterated condition, while the efforts of municipal committees in the direction of improving the conditions in cattle sheds and dairies, and of guarding against dilution or adulteration, have to be most cautiously restrained for fear of causing still further enhancement of prices.

It would be an immense advantage if wealthy land owners in the vicinity of great cities would combine philanthropy with business and take up dairy farming on a large scale as is done with such success in the West. This would involve not merely the organizing under the one scheme of the production and collection of milk, but its general distribution by road and rail and its retail distribution through sanitary hygienic milk depôts. It would seem that the benefits of such a system would be so great as to wholly justify subsidies from local public funds.

As regards the villages there is not usually the same dearth of milk, and the effects of scarcity do not show themselves so much in an increase of tubercle since the inhabitants are more in the open air and the infection is less omnipresent.

It is of course in the case of children that the shortage of milk assumes its really serious aspect. One essential part of the activities of the Child Welfare Associations which are nowadays being established will surely be the organization of a supply of good milk to the delicate children for whom it is of such vital importance.

2. Close Intermarriage.—It might be thought from what has already been written (see page 73), regarding the non-transmissibility of the tubercle infection by heredity that tuberculosis would not be one of the diseases whose prevalence is increased by inter-marriage. The reverse, however, is the case. There can be no doubt that the tendency of close inter-marriage or "in-breeding" is to accentuate any constitutional weakness that may exist in the original stock. And though it seems certain that tuberculosis itself is not as a rule

hereditary, yet the enfeebled physique and lessened power of resistance, or even the mental character which accepts a sedentary unhealthy mode of life in the place of an active health-giving one, may undoubtedly be transmitted from parents to child, and such tendencies will naturally increase as a result of inter-marriage.

It is probable that this cause may produce its effects as regards tuberculosis in an even less direct manner than is indicated above. As is now fully recognized, it is the frequent infection of young children brought up in a tuberculous environment which causes the spurious "heredity" so often noted. When both parents come from the same stock, and that unsatisfactory, this possibility of home infection becomes exaggerated.

Further, speaking very generally it may be said that the communities amongst which close inter-marriage is practised tend to be, as compared with others, backward and reactionary; even in some cases decadent. The barriers of exclusiveness which they have built shutting themselves off from their neighbours as regards matrimonial alliances, have often had the apparent effect of isolating them in a rigid conservatism as regards domestic and social habits and customs. It is amongst such that we find the seclusion of women most strictly enforced, early marriage most prevalent, and the houses still dark, crowded and airless, the people in them being uninfluenced by the strong movements towards improvement which other communities are feeling.

Be the causes what they may, the fact remains that in visiting cities or districts where there happened to be some limited exclusive community, practising inter-marriage to a considerable extent, that community would almost invariably be pointed out as being the one in which tuberculosis was specially rife. To give a few instances of this I may mention the families of the nobility in certain Mohammedan States, those of some of the well-known Hindu chiefs of Rajputana, the descendants of the Moghal Court families at Delhi, Lucknow or Murshidabad; limited religious communities such as the priestly caste of Gaya ("Gayawals"); or the families of expatriated Afghan nobles in Peshawar and the Punjab.

Professor Geddes in one of his Madras lectures quoted—in quite a different connection—the following

words from a petition from Mohammedans at Madura, protesting against a proposed extension scheme:—"We all belong to the same caste and religion, and are practically all related to one another." It is easy to imagine the result as regards facilities for infection as well as for the hereditary transmission of physical tendencies which may underlie these words.

Along the Southern Coast near Tuticorin there is a considerable community of Roman Catholics, whose ancestors became converts from Hinduism in the time of Francis Xavier. This whole clan called "Palawars," consisting both of poor fisher-folk and others who have raised themselves to a higher social position, have kept strictly to themselves, not marrying outside their own community, and tuberculosis is said to be very frequent amongst them. Even amongst the Parsis, the most progressive of all the peoples of India, this inter-marriage has been mentioned (rightly or wrongly) as a causative factor, in the case of the limited groups of this community which exist in many cities away from Bombay, and amongst whom the prevalence of tuberculosis is often considerable.

In the Punjab and some other parts of India, the law regarding inheritance is directly calculated to encourage inter-marriage. An heiress who marries outside the family loses her claim to her share of the family property, while if she marries a cousin, her rights remain unaffected, since the property is not then alienated from the family.

3. Early Marriage of Youths.—The evil effects of early marriage are by no means confined to girls although it is amongst the latter that these effects are the more serious. At many colleges visited, the larger proportion of the students (at one centre 90 per cent.), were said to be already married, and members of the teaching staffs were strong in the opinion that the practice of marrying boys during the period of education tended not only to hinder the progress of study, but to impose an undue burden upon the mental and physical stamina of youths not as yet settled into manhood. There is already a marked tendency towards delay of marriage in the case of the educated young men in the larger cities, and it would seem that such delay is wholly

advantageous, although I do not forget the lament of a certain Bengali would-be grandfather, who used to oppose child-marriage, but no longer felt able to do so, since his boy was now 40 years old and was still unmarried!

Whilst not advocating delay of marriage to the age of 21 or 22 years as in the West, yet for young men in India not to marry as a rule before 18 or 19 years of age would mean the avoidance of much misery due to lack of experience and to ignorance, and the escape from burdens, sexual and domestic, which without doubt in many cases predispose young men to tuberculosis as well as to other diseases. Early marriage is an easy way of putting an end to the necessity for continence, which boys find hard to submit to, and which often proves a source of anxiety to parents and guardians. The more, however, it becomes a recognized element in the life discipline of Indian youths that they should learn to exercise self-control for a certain period, not too much prolonged, the better will it be for themselves, their wives, and the children that shall be born to them.

4. Trades and Occupations which predispose to Tuberculosis.—It is only possible in the present report to attempt in the most general way to apportion the blame for the spread of tuberculosis amongst the various avocations of the people. It may be stated at once that the ordinary mechanical occupations of the East, carried on more in the open air and in private houses, and less in crowded workshops; more deliberately and with less pressure; depending more on hand power and less upon machinery; are far less calculated to be predisposing causes of consumption than is the case in Western countries. In the United Kingdom there are various forms of consumption bearing special names, such as "Knife-grinders' Phthisis," "Miners' Phthisis," etc., in which the constant irritation caused by the presence of minute solid particles in the air breathed, gives rise to an inflammatory process in the lungs, which is particularly apt, on the entrance of the tubercle bacillus, to take on a tuberculous character.

Such cases are not sufficiently common in India to attract general recognition, or to call as yet for special measures of protection, and yet even here there are

certain industries which involve the constant breathing of air charged with irritating particles, and concerning the employees of which inquiries at once elicited the information that consumption was more prevalent amongst them than amongst other workers of the same class and locality. As instances of this we may mention those employed in the rice-cleaning mills of Burma, or in the quartz-crushing mills in connection with gold mines, the underground labourers in coal mines,* and workers in cotton ginning mills, and jute factories. Further inquiries as to the conditions of work obtaining in India in such industries as the above, will, I feel certain, emphasize the need for the more general introduction of appliances such as exhaust fans and other measures to safeguard the health of the work people concerned.

There are other industries in which an abnormal prevalence of the disease seems to depend more upon the accompaniments of the occupation than upon the presence of particles in the air. There are two occupations which in almost all parts of the country are credited with furnishing a disproportionate number of victims to tuberculosis; these are tailoring and weaving. The explanation of this would seem to be directly connected with the conditions under which many of the "darzis,"† and of the lower class of town weavers, carry on their work.

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* **Note.**—It seems to be an established fact that workers in well managed coal mines in England are not specially liable to phthisis in spite of the coal dust which they are continually breathing. This may be because coal dust from its mechanical structure has not the same irritating effect upon the air passages as the harder particles of quartz or steel; or it may be due to a specifically favourable action of the organic elements of coal itself.

In Indian coal mines, however, tuberculosis is decidedly frequent amongst the underground labourers and no one who has had practical experience of the conditions often obtaining in the more remote workings—stifling heat with an atmosphere at saturation point, and spitting without control—would wonder at the fact.

† The "darzis" who suffer thus are the lower class "under-tailors" who make up clothing for Indians in workshops; not the highly paid individuals who work for Europeans.

The "darzis" work as a rule crowded together in ill-ventilated rooms, spend their days, usually very long days, bending over their work which by its nature tends to contract rather than to expand the chest. They are commonly poorly paid, and therefore underfed, and moreover they belong in large measure to that lowest-middle section of the Mohammedan community whose houses are probably infected to a greater extent than those of others, and whose women are kept in seclusion while living in wholly unventilated rooms. The home life as well the workshop life of the "darzi" presents almost every condition favourable to tuberculosis.

So also with the weavers; they are usually illpaid, while the work is for long hours under usually the most unsatisfactory conditions. The work at hand-looms involves considerable and unremitting physical exertion of a nature calculated to narrow the chest, and is carried on indoors in an atmosphere usually charged with woollen particles and dust. The floor is always of mud to admit of the adjustment of the loom framework to suit the special work in hand. Some of the indigenous carpet factories, especially those where young boys are employed, call urgently for systematic inspection and regulation. I visited one in which three out of twenty boys in a crowded shed were suffering from advanced tuberculosis and all looked under-fed and over-worked; another where in a dirty weaving room the ground was almost muddy from the expectoration everywhere.

As regards the larger mills and factories, while of course there are individual instances where conditions are far from satisfactory, yet they are now subject to very definite and stringent legislative control, and under a system of official inspection which is steadily increasing in efficiency. We may thus regard the tendencies in the case of these larger industrial concerns as being distinctly in the direction of improvement.

It is otherwise in the case of many of the smaller workshops, where more petty manufactures are carried on by private employers often under conditions which contravene every canon of hygiene. It must necessarily be a very gradual process for Government control to deal in any practical way with these numberless minor establishments. In the meantime it would seem that useful

preparatory work may be done in arousing public opinion to insist upon better conditions of labour for workshop employees, many of whom are poor women and children, quite incapable of taking action on their own account.

Both in Cawnpore and in other great manufacturing centres, some of the mills have expended large sums of money in schemes for the housing of the workpeople under sanitary conditions, within easy reach of their daily work. Such schemes are admirable, and it is only to be regretted that there seems to be some almost insuperable difficulty in hitting upon a style of dwelling which will be really popular as regards those for whom they are intended. Such "workmen's lines" are usually all occupied, but the rents paid are usually insufficient to give a due return upon the expense of construction, employers being content to let the quarters at unremunerative rates because of the better health of the workpeople, and the increased control over them which is thus secured.

In cotton mills wherever situated there is one factor necessarily unfavourable to health, in that during part of the process of manufacture, it is necessary to keep the atmosphere of the work rooms charged with moisture. This may account for some degree of prevalence among the workpeople and it is of obvious importance that the degree of humidity should be kept to the lowest possible limit. Even in these mills, the fact that the men are well-paid and therefore well-fed, seems to place them in a better position than those whose work-environment may be more favourable but who are in a chronic condition of semi-starvation. Apart, however, from the temporary need of keeping special work rooms hot and damp, it must be remarked that many of the best arranged factories fail to take full advantage of their facilities for fresh air and ventilation. Indian workpeople seldom take the trouble to open windows themselves, and it is common to see a mill-block whose walls show almost as much glass as brick, but whose windows are all shut, and this on days when abundance of fresh air could be nothing but a blessing and advantage. This remark applies to offices as well as factories and the fact calls for watchfulness on the part of those in responsible charge.

The mere aggregation of people day after day in one building is in itself a source of risk, and this can only be obviated by continually flooding the place with fresh air. Factory work-halls whose walls have an immense area of window, are light, it is true, and look healthy, but are only potentially airy. The atmosphere may be as close as in a dark old-fashioned workshop, if the windows are kept closed. At one large weaving establishment in Western India I saw three men with very advanced phthisis within three minutes, one working in a hall crowded with looms and with over 200 occupants, and the other two in the adjoining dyeing rooms. The danger of infection in such cases is most serious. The enforcement of rules regarding spitting, and the provision of special receptacles for the purpose, are measures of the greatest importance, wherever large numbers of workpeople are collected together in factory buildings. In all these matters the help of factory inspectors is of very great value, and their appointment in certain provinces is already having a most beneficial effect as regards the sanitary conditions of workshops and the health of employees.

The railways of India give employment to about half a million men, and, although my inquiries, addressed to the Medical Officers of the principal railways, were not very fruitful of actual statistical information, yet the evidence which I received was sufficient to establish conclusively the fact of marked prevalence of phthisis amongst certain sections of the workers. It is amongst the higher grades of railway employees (station-masters, clerks, etc.), that the greatest number of cases, both relatively and absolutely, are said to occur. Amongst these, the Anglo-Indian element bulks largely, and it is probably true (see pages 71, 72), that the members of this community are somewhat specially susceptible to tuberculosis. The menial servants of railways do not seem to suffer much from the disease.

No one who has travelled much in India can have failed to be impressed by the very unsatisfactory hygienic conditions prevailing in many of the office rooms in railway stations. They are too often dreadfully close and ill-ventilated, with accumulations of old dusty records and rubbish, which certainly suggest the possibilities of

tuberculous infection for the numerous clerks employed in them; while the lamps are usually of a design which seems specially adapted to give a minimum of useful illumination with a maximum of glare, heat and oxygen-consumption. There is seldom to be found, away from the few really modern stations, any indication of attention having been paid to matters such as these. The installation of electric light in the offices of the larger stations would itself be a measure of real importance.

An immense amount has been and is being effected in the direction of improving unfavourable conditions, but this has mostly been in connection with extensive schemes of renewal, in centres where the increase of traffic has called for a complete remodelling of all the buildings. It would seem that too often the minor alterations which, at a comparatively trifling expense, would suffice to transform a close, unhealthy building into a comparatively airy and hygienic one, are held over for years, because it is recognized that sooner or later the whole station or range of buildings will call for reconstruction.

If inspecting officers who themselves know the value of fresh air were to impress its importance upon the local station-masters and superintendents, and were to take special note, when inspecting, of evidences of care as regards neatness and cleanliness in offices, a great deal of "levelling up" of conditions might be hoped for. The insistence upon the regular cleansing of clerestory and other windows, and the provision of fittings (window-cord, etc.), whereby they may easily be opened and closed, would much improve the conditions as to light and ventilation of many station offices. The importance of more efficient ventilation for railway offices, especially those in the larger stations, is greatly emphasized by the fact that, unlike most other offices, these are in occupation throughout the whole 24 hours.

There has been very great improvement in the housing of the menial staffs of most railways during recent years. The quarters are usually of a very solid style of construction, and the chief general criticism to be made of them, is that even when planned on hygienic lines they lend themselves too readily to the efforts of

occupants to seal them up hermetically from the outside air.

The question of the possible provision of some facilities for the open-air treatment under sanatorium conditions of consumptive railway employees, will be dealt with in the final section on Prevention.

As might be anticipated from the nature of his work, the Indian sweeper or scavenger is somewhat specially liable to consumption. The prevalence of tuberculosis amongst the menial staffs of some of the larger hospitals is no doubt the result of infection contracted in the course of their work, and it emphasizes the importance in the case of indoor sweeping, of insisting upon floors being first sprinkled with water, and with something such as sawdust or tea-leaves to which dust may adhere previously to its being swept into the receptacle and removed. The dust in India is in any case sufficiently ubiquitous, without the constant senseless and lazy efforts of sweepers who think that when they have distributed the dust of floor or road widely in the air, they have thereby succeeded in making their area clean. The introduction on a large scale, especially in hospitals and other institutions, of the principle of vacuum cleaning, whereby the dust is forcibly sucked up into an exhausted receptacle *and removed*, is greatly to be desired.

In England, in these days of post-war reconstruction, labourers are demanding better conditions than before, and employers are frankly recognizing the justice of their claims. Upon the leaders of public opinion in India rests the heavy responsibility of safeguarding the interests of the less articulate workers in Indian mills. It is most of all for the protection of children that legislative control of factories and workshops seems to be urgently needed. In one city where children under 12 years of age were being examined in large numbers at the civil hospital, and given certificates enabling them to work in the mills six hours a day, I found that parents often attempted to have their boys certified under two names, so that they could do their six hours in the morning at one mill, and again in the afternoon at another.

5. Factors special to Burma.—A few words must be added regarding the causation of tuberculosis in Burma, where many of the social habits and customs differ

widely from those in India. Amongst the Burmese women the system of purdah is practically unknown, so what has been said above regarding the detrimental influences of the seclusion of women in reference to spread of tuberculosis, is here not applicable. The women move about as freely as the men, and indeed in many places amongst the middle classes, the men seem to have a more sedentary life—as clerks, students, teachers, etc.,—than do the women. The same may be said with regard to child-marriage, which again is unknown amongst the Buddhist population. The absence of these two important social customs is reflected in a quite remarkable manner in the sex prevalence of the disease amongst the Burmese (see page 139).

One other great advantage which Burma possesses in common with Southern India, is its climate, which permits everywhere of a light and airy style of architecture with abundant ventilation. Nowhere except in the hills is the cold so great as to compel closed-up houses, and in the villages throughout the country, the dwellings are constructed for the most part of bamboo and matting built upon timber piles, and affording atmospheric conditions within them not very far removed from those of the air outside. As a result, consumption in the villages is comparatively rare, while the insanitary habits of the people are robbed of much of their power for evil.

The towns in Burma, however, are rapidly growing at the expense of the rural population, and when village Burmans, accustomed to live in matting and bamboo huts surrounded by plenty of open space, come into the utterly different environment of town life, the effect is only what might be expected. In the village hut they crowd around sick people with absolute carelessness of infection, and they spit continually—without any serious risk—between the crevices of the bamboo floor down to the open ground below. The village Burmans, like the Chinese, are undoubtedly hyper-susceptible to tuberculosis infection, and they naturally bring their habits with them when they come into the towns, where the houses, although built of timber, are for the most part dark, dirty and unventilated. The habit of spitting within doors is almost universal and there is the utmost freedom as regards the sharing

of food vessels, cigars and the like. There is general carelessness as regards disease infection and nothing is more common than for a patient with advanced phthisis to be continually surrounded by sympathizing relatives who have not the slightest consciousness of the risks which they run.

There is a curious idea current throughout the whole of the country, and shared also by the Chinese, that the smell of cooking, and especially of cooking oil, is highly injurious to the sick. This dread of "ngaw," or cooking smell, is a great obstacle to any attempts at effectual ventilation, since it compels the relations of sick people to carefully close the windows and doors of rooms where patients are lying, or to cover them up under heavy curtains or rugs.

Another practice which is common throughout Burma, probably connected with the idea just mentioned, and which cannot fail to have a very prejudicial effect in this connexion, is that of using for protection against mosquitoes, material for curtains which is quite unnecessarily heavy and thick in texture, deserving the name of cloth rather than netting. This prevents the free circulation of the air to a very great extent, and when—as is often the case—several members of the family sleep under one such heavy curtain, and still more when one member of such a family be consumptive, the possibilities of serious risk are obvious.

In many of the towns in Lower Burma, the water-logged condition of the ground during the rains, and the constant high level of the subsoil water at other seasons leads to that dampness of the habitations which is a well recognised auxiliary factor in determining the local prevalence of tuberculosis. This fact of course emphasizes the importance of extending efficient systems of surface drainage throughout the towns of Lower Burma.

Although, owing to the absence of caste regulations, some of the worst hygienic evils connected with child-birth which are observed in India are absent in Burma, yet in many respects there is nothing to choose as regards the practices common in the two countries. Nowhere is greater insistence laid upon the avoidance of fresh air in the lying-in chamber, while the patient is subjected to a process of "cooking," by stoves and hot applications,

which, together with the careful avoidance of nourishing diet, must tend seriously to reduce her strength at these critical times. Consumption is by no means an infrequent sequel to confinements in Burma, although this does not seem to be so common as is the case in many Indian cities.

Amongst the Indians who come in large numbers for purposes of trade or labour, to Rangoon and other towns on the coast, the incidence of tuberculosis is far higher than amongst the Burmans, but this prevalence does not appear in mortality returns, owing to the dread of dying in a foreign country which compels the sick whenever possible, to return to their homes.

CHAPTER XV.

EDUCATIONAL INSTITUTIONS AND THE SPREAD OF TUBERCULOSIS.

It is an unfortunate but undeniable fact that educational institutions must bear a considerable share of the responsibility for the spread of consumption amongst children and students in India during the past half century. While education has been doing much to diffuse amongst the people the knowledge of better ways of living, yet the institutions and methods connected with education have not always been above criticism, and—for those who have had eyes to see—the clearest danger signal, warning of error either in institution or management, has in many cases been the insidious spread of consumption amongst the inmates.

Western education came to India at a time when the causes of consumption and the nature of its infection were nowhere understood, and when the special dangers inherent in bringing large numbers of children into close contact with one another were most imperfectly realized. Had the establishment of schools, colleges and orphanages been delayed until the present time, when the proper relation between the training of the mind and that of the body is beginning to be fully understood, and when the value of fresh air and physical exercise is recognized on all hands, there might have been no cause to connect the work of the schoolmaster with the spread of consumption.

There are some who will roundly question the grounds for anxiety or the necessity for any change, who believe that even at its worst the school is better than the home, and that any prevalence of tuberculosis that may have been noticed in school children is due almost entirely to infection from their own homes. To these I would only reply that any who speak thus must be ignorant either of the conditions in very many schools, or of the normal prevalence of the disease in the general population.

The great majority of the institutions visited in the course of my tour were wholly admirable, providing for

their inmates health conditions incomparably better than they would have at their own homes. There was, however, a not inconsiderable minority regarding which the report would be given, and given without any sense of stating what was exceptional or specially calling for consideration, that not more than one, two or perhaps three pupils had died from consumption during the previous year, and this in schools of from 80 to 150 scholars.

In order to understand the seriousness of figures such as these it is necessary to inquire as to the normal frequency of deaths from consumption amongst children in our cities. If we select Lahore as a city where the prevalence is somewhat extreme we find that, out of a population of 210,271, there were in 1913 a total of 630 deaths from tuberculosis; and further, that out of this total number only 114 were children below 15 years of age. From these figures, taking 388 as the number of children below 15 years of age in each 1,000 persons, a simple calculation gives the death-rate per mille of children below that age as almost exactly 1.4. This means that if in an institution containing 1,000 children, three died of consumption in every two years this might be regarded as reflecting the mortality from the disease in the general population. Even then however it would be the duty of the head of the institution to make further efforts, as many are doing with success, aiming at reducing the mortality of the institution to a figure far below that of the children in cities.

If then in any institution containing say 100 inmates under 15 years of age, there have been three deaths from consumption within two years, it would seem that this represents a mortality almost exactly 10 times as great as that found to exist amongst the children of a similar age in one of the great cities where the disease is rife. More serious even than this heavy mortality is the degree to which infection must take place amongst the remaining inmates under the conditions of intimate intercourse afforded by most of the institutions under notice. The records of the after-history of the children who have been at such schools show all too clearly that the toll taken by the disease is not limited to the number of those who die during childhood.

The facts stated in the above paragraphs will, I hope, justify my entering with some detail into the subject of the prevalence and causation of tuberculosis in educational institutions, and in doing so I shall naturally confine myself to those aspects of the subject and to those particular classes of institution which have seemed to me to be of special importance in connection with the question under inquiry.

It is not easy to separate the subject into sections since what we are considering is the resultant of a variety of causes which act not separately but in combination. It may however conduce to clearness if we attempt to deal in succession with certain of the outstanding possibilities of harm from the tuberculosis standpoint, as they have forced themselves upon my notice, during the inspection of a large number of educational institutions of all kinds and grades throughout India. May I add that for the large majority of those seen there could only be unqualified praise; the undoubted need in many other cases for modifications in methods or plant must be my excuse for mentioning their defects in some detail.

1. Change of Environment.—The fact needs to be more clearly recognised that the contrast for an Indian child who leaves home to go to a boarding school, is incomparably greater than that which obtains in the case of a European child. In the latter case the whole regime, the ordered hours of work and meals, the discipline, merely represent a certain "tightening up" of the routine of life as at home; in the former it means an almost complete reversal of all previous experience.

A somewhat close acquaintance of the conditions of Indian life is needed to enable one to realise the extraordinary freedom of a little child's life at home. The laxity of discipline, the absence of strict rules as regards times of rising, of going to bed, or of meals, the frequent opportunities of obtaining food between meals, the general freedom from restraint, are such as to greatly accentuate the degree of change of environment involved in the sudden plunge into life in a boarding school managed on Western lines. It is not my purpose to criticise either regime. They both have their special

points of advantage; what I would urge however is that the sudden change of environment calls for most understanding and sympathetic treatment on the part of those who have the charge of such little ones.

Tuberculosis is the disease which more than any other tends to come to the fore as the consequence of this somewhat sudden change in the conditions of life. There is an instructive analogy in the case of monkeys and certain other wild animals, which in spite of the comparative freedom of their life when in captivity in well-appointed zoological gardens, yet need the most scrupulous care to protect them from dying of consumption. The fact that children are often able to be more in the open air when at home than when at school, is by no means the only element, albeit usually the most important, in this change of environment tending towards tuberculosis. These various factors will be dealt with later on under their special headings. It is the resultant of them which suffices to produce in the unstable frame of the growing child, just that loss of elasticity, with diminution of vital power to resist disease, which prepares the way for consumption, whilst the aggregation of many children in the one institution brings with it the possibility of infection.

It is in the case of Orphanages, more especially those which have been suddenly established after a time of famine scarcity, that the results of such change of environment are most clearly to be seen and where the most far-sighted precautions are required. In such institutions it is only to be expected that there should be a certain amount of sickness and death at first, owing to digestive disturbances set up by the preceding starvation conditions. But as regards the sickness which follows later, and which has so frequently taken the form of epidemics of tuberculosis, I urge that the time has come to abandon once and for all the time-honoured explanation of "constitution undermined by hardships in early childhood," and seek for the cause in the institution itself.

There are Orphanages where not a single case of tuberculosis ever occurs, and there are others where it has been a decimating scourge, and the reasons of the difference are seldom hard to discover.

To sum up these general observations; what is to be remembered is that the element of *change* itself is in young children fraught with the possibility of danger, and that we do well to keep under careful restraint our ardour for the immediate correction of habits of life (connected, *e.g.*, with time-routine, food, or clothing) which may seem objectionable or even evil, avoiding sudden breaks of continuity, and bringing in gradually and softly the reign of better things.

2. School Buildings and Over-crowding.—As regards educational buildings in India, one is struck by the very wide difference between the two extremes of the scale of excellence. At the one limit there are palatial buildings erected with lavish expenditure of money and with arrangements comparable with school and college buildings anywhere in the world. At the other end of the scale, however, we have schools by the hundred, or even by the thousand, of which the conditions are most unfavourable, and which in a Western country would not be tolerated for a moment.

Speaking generally, it must be admitted that Government is generous in the financial aid which it gives to educational institutions of which the equipment and general arrangements are regarded as satisfactory. Not only do the educational authorities aim at introducing and maintaining the highest standards of efficiency in Government schools, but by making grants-in-aid to private institutions contingent upon similar standards being attained, they are doing very much to improve matters everywhere. The authorities of mission and philanthropic institutions have the highest motives for aiming at efficiency. It is, on the other hand, in the numberless schools carried on by private enterprise in the cities, for the most part in independence of inspection or control, and of which the financial success depends on the numbers of scholars admitted, that the worst conditions as to sanitation and overcrowding are found.

In planning buildings where a large number of children are to be accommodated it is necessary to bear in mind that the mere bringing together of numerous children into a closed and roofed-in space involves of necessity two dangers:—(*a*) that of infection, not merely

of tuberculosis, but of other diseases, such as catarrh, measles, small-pox, etc., and (*b*) that of lessening the power of resistance to disease.

The one main safeguard for both these risks is in the provision of fresh air in abundance, and the necessity of this is greater in proportion as the children have been more accustomed to being in the open air at their own homes.

In a vast number of cases this fundamental need has been and is still simply ignored. In the earlier days of education in India, the principles underlying ventilation and the spread of disease were unknown, and school buildings were designed with a view to protection from the extremes both of heat and cold. The best means was isolation from the outside air. Hence the thick-walled mud structures in the Punjab with their impervious roofs and small windows, or the still more objectionable old-fashioned school buildings in the United Provinces and elsewhere, with their immense roofs of thatch sloping low down to the verandahs, and rendering efficient ventilation or lighting almost impossible. It is very true that a large number of such schools have been modified, or have been rebuilt on modern hygienic lines, but it is no less true that multitudes still remain which are an obvious source of danger both to teachers and taught.

As a typical instance of the sort of buildings alluded to I may mention a girls' boarding school containing 130 girls. Here I found two rooms each 18 feet by 16 feet by 12 feet, both of them used as class rooms all day and as dormitories at night, when they were occupied by 30 children each, all sleeping upon the floor. Until quite recently both shutters and doors were kept tightly closed at night time, leaving four small oval apertures, 1½ feet by 1 foot for ventilation, 10 feet from the ground. The roof was tiled but impervious. Cubic capacity 115 c. ft. per child; superficial area 9.6 sq. ft. per child; lateral ventilation when windows shut, 6 sq. ft. *for* 30 *children*. Another dormitory was 40 feet by 9 feet accommodating 40 children. Here also all shutters were until recently kept carefully closed at night time. Cubic capacity 108 cubic feet per child; superficial area 8 square feet per child.

So much for boarding schools. As for day schools, there are thousands of these in India, especially primary ones in villages, where the limit of accommodation seems to be literally the physical impossibility of crowding more than a given number of human beings into a fixed space. In one such school there were 50 children and 2 teachers in a room 16 feet by 12 feet with no window, and only the doorway for light and ventilation. In another the school room measured 13 feet by 11 feet and here again the average number present was 50. Both these rooms were approximately 10 feet in height, so that the former instance gives a cubic space of just under 37 cubic feet per child and a superficial area of 3.69 square feet, while in the latter case the cubic accommodation works out at 28.6 cubic feet and the area at 2.8 square feet per child. The British Board of Education gives a minimum superficial space for class rooms, of 9 square feet for infants, and 10 square feet for older children.

As to these unsatisfactory buildings, there are those whose responsible heads realize and deplore the defects in their institutions but plead the lack of money needed to remedy them. This would seem to call for an arousal of a fresh opinion amongst educational authorities, missionary societies and other teaching organizations as well as amongst leaders of Indian thought, in the directions of:—

(*a*) A more equitable distribution of the funds available for educational purposes, aiming at a higher level of *average* efficiency.

(*b*) A clearer recognition of the heavy responsibility resting upon those who attempt to educate the young whilst neglecting their physical development and well-being.

(*c*) Most important of all, a thorough-going revolution in many ideas commonly held as to the most suitable lines upon which school buildings should be constructed.

There are however very many schools which remain unimproved, because those who are in charge of them entirely fail to realize the need for alteration. Again and again excuses such as the following are made:— "What has been good enough in the past is good enough now," "A certain amount of sickness from time to time is only to be expected, and such cases of consumption as

occur have almost all been due to home infection." Here the need surely is for a great campaign of education in the elements of practical health knowledge which, if it is to be successful, must begin with the educationalists themselves. Such a campaign for the diffusion of knowledge will not merely mean the addition of a new subject to the existing curriculum, but it will mean the creation, first in the teacher, then in those under his influence, of a new appetite for those conditions—fresh air, light, cleanliness—which are available to all, and the value of which once realized would work miracles of change both in schools and homes.

It would be doing the greatest possible injustice to those responsible for Indian education, if I failed to acknowledge the enormous progress that has been made of recent years as regard improvements in school accommodation. Everywhere new schools and colleges have been erected, a large proportion of the old established institutions have had their buildings completely renewed or greatly modified, and in practically all cases the new have been immeasurably better than the old, from the hygienic as well as the educational point of view.

Have we however as yet attained the ideal as regards buildings for educational purposes? I would humbly express a negative belief, and would venture to suggest that higher efficiency might be obtained with greater economy, thus leaving money available for the primary schools where the need for improvement is so urgently felt.

My own hope is that, with the exception perhaps of the great provincial colleges, we have reached the maximum limit of expenditure upon school buildings, and that the future tendency will be rather in the direction of less expensive, less substantial, but far more airy structures, in the building of which the aim will be the attainment of fresh air conditions so far as may be compatible with educational requirements, the security of person and property, and protection against actual inclemency of weather.

In the construction of the present-day school buildings science and money have gone hand in hand. Careful calculations have dictated exactly the correct amount of superficial area, or of cubic capacity for each child, together with the area of inlet and outlet space for

ventilation. It is estimated a child requires not less than about 1,500 cubic feet of fresh air per hour, and the problem of efficient ventilation is to secure this by constantly renewing the atmosphere without at the same time causing violent currents of air which will have the chilling effect of "draughts."

The best authorities give the amount of cubic air capacity required in school rooms during hours of work as 130 cubic feet per child, with a superficial area of 10 square feet, while it is reckoned that the capacity of dormitories should be not less than 450 cubic feet per child, with a superficial area for each one of not less than 40 or 45 square feet. Such figures as these however are based on the assumption that the ventilation arrangements are such as to ensure the constant and automatic renewal of the air in the rooms.

The immediate result of standards such as these is that a vast number of school authorities, finding the immense disproportion between the new standard proposed and the previously existing conditions, frankly express the impossibility of even approaching them, and their schools remain *in statu quo*. On the other hand those who feel that the dictates of science must be obeyed without question where health is concerned, have regarded the heavy expenditure as inevitable, and thus the fashion has been set of the present style of school building, heavy and substantial in construction, with lofty halls and class rooms, fitted to be a lasting memorial to those who erected them, but at the same time a heavy burden upon the local finances.

Furthermore, since the windows in such institutions are always carefully glazed, all the elaborate calculations regarding cubic capacity and ventilation fall at once to the ground, if those in charge of the class rooms or dormitories fail to realize themselves the value of fresh air. While acknowledging that in this respect also great and rapid improvement is apparent, yet even now it is very common to go into a crowded class room where windows are sufficient, and to find them all closed. The experience has recently been not at all an uncommon one—in visiting both schools and hospitals—of being conscious of a chaprasi having been despatched in advance to make all ready in this respect!

In advocating a less substantial style of architecture for school buildings it is not the ordinary Indian conception of a light and airy structure which I would praise; "wattle and daub" with a framework of rough untrimmed timber, of which the work as well as the materials are alike *kutcha* and in constant need of repair. A lightly built structure needs the best of materials and the best of workmanship if it is to be lasting, and if even so it be objected that it is not so permanent as the stone or brick edifice, I would reply that in India at all events, permanence beyond a certain limit is not an advantage. Conditions are changing so rapidly that in the case of ordinary schools a lifetime of say 40 years is in my opinion quite sufficient to aim at. As with cities so with public buildings, it is the heavy stone structures which often block the way of progress. It goes without saying of course that for schools which are to last for 40, instead of 80 years, the need for economy in building is all the greater.

So may we not hope to see—as now on all sides in Western countries—the lighter building materials used for Indian schools; iron, not in heavy girders but in light framework and sheeting, asbestos tiles and sheeting, lath and plaster panelwork and light well-sawn timber? In villages where the climate admits of materials like bamboo, rush, straw, or matting, the difference which might well mark off the school building from the ordinary village hut, would be that the former would always have a *pucca* floor, while the walls and roof of matting or thatch, admirable from the point of view of ventilation, would be kept in place by a light framework of angle-iron instead of the usual poles of bamboo or rough timber. The increase in expenditure is far more than compensated for by the additional permanence and tautness of the structure.

What I am anxious to see is the popularization of such a style of architecture for schools as shall lend itself more naturally to the open-air regime both for teaching and for sleeping, which is so rapidly forcing its way into the best of our educational institutions.

In future school planning, calculations as to cubic capacity, and even many of the present ideas as to scientific ventilation, will assume less and less weight, and will,

I believe, gradually be relegated to the past, while the aim will be to make the atmosphere within doors, as far as may be, one with the atmosphere without; not cautiously admitting outside air into rooms purposely built large so as to obviate the chilling draught, but flooding rooms and dormitories with fresh air from outside in such abundance that the thought of draught does not arise. It will be objected that there will be danger from cold and discomfort from heat. But if in England and North America such open-air schools are possible, surely they are far more so in India, where the really inclement weather is usually concentrated into two months of the year, and can be for the most part avoided by careful arrangement of holidays. As has been already pointed out (see pp. 165, 166), the excessive heat of the Punjab is not less, but more easily endurable in a space so open as to admit of the freest possible circulation of air.

In the actual detail planning of such open-air schools local climatic conditions will naturally need consideration more than in the case of ordinary brick and stone buildings. There are numerous books on the subject of open-air schools in Europe and America, and in these there will be found plans and illustrations showing how difficulties of rain, wind, light, etc., may be met. In districts where dust storms are very frequent, it may be necessary to arrange for complete closing of teaching rooms when necessary, but this need not prevent the school being so built as to admit of open-air teaching as a routine practice.

In very many schools of the prevailing type where the number of scholars has largely increased, it has become the regular custom for the junior classes to be accommodated on all but very rainy days in the verandahs, which themselves are often badly suited for the purpose, being exposed to wind and glare. Why should not the verandah type of accommodation become the normal one for all junior classes, class rooms being reserved for the senior classes who need more apparatus? The verandah would then naturally be expanded into a spacious roofed area, sheltered by the school building proper on the side of the prevailing winds, and divided up, if necessary, into spaces for separate classes. Since almost everywhere verandahs are already used for class room purposes why

not build them accordingly, and secure the great advantage which comes from purposeful adaptation?

The Educational Department of the Central Provinces has an admirable standard design for a cheap village primary school for 100 girls. This consists of a single square room, a broad 18 feet verandah, and a courtyard enclosed by a wall, the cost of the whole being only Rs. 1,330.

As regards village schools especially, I would urge this system of building for fresh air. Everywhere one sees Indian masters showing their appreciation of the advantages of the open air, by holding their classes out in the school compound whenever conditions permit, but how seldom does one find deliberate building of shelters as distinguished from closed school-houses. In choosing the site for village schools how often is the priceless value of the shady tree overlooked, while, given one closed room for office purposes and necessary furniture, it is probable that in very many of such schools the best possible teaching accommodation would consist of broad "lean-to" verandahs or shelters, arranged so as to give the maximum protection from sun, wind, and rain.

It is true that open-air teaching has the one objection that it may render mind concentration and attention more difficult. This may explain part of its popularity with the scholars and most of its unpopularity with the ordinary educational authorities. It is usually, however, not difficult to make arrangements such as will secure for the separate classes some measure of isolation from each other and from the outside world, while the gain in health and mental freshness for the children is more than enough to compensate for any sacrifice of educational efficiency.

At Sakhi Gopal, a well-known pilgrimage centre near Puri, there is an institution, the Satyabadi High School, established on philanthropic lines by a body of earnest young Hindus. Soon after its commencement the main buildings were destroyed by fire, and ever since this time all the teaching for 9 months of the year has been carried on in the open air, to the great satisfaction of teachers and students, which latter number 340 boys. The classes, which are held in a large grove of beautiful spreading trees, are completely isolated from each other

by thick shrubs, winding footpaths leading from class to class. The boys sit on rush mats on the ground, with their books upon very low benches in front of them (see page 218). The dining-hall is a broad, cheaply-built "lean-to" verandah, entirely open to the air along one side. The dormitories were built to accommodate 6 students each and measure 22 feet by 10 feet. A block of ten such rooms accommodating 60 boys cost only Rs. 600. *Not a single case of consumption has occurred in the school since its commencement.*

It was difficult not to view with great regret a large two-storied brick building of the ordinary type recently erected at a cost of some Rs. 12,000, apparently as a necessary sequel to affiliation with the Calcutta University. If the new building tempts the masters away from the open air we shall hear of consumption cases at Satyabadi as in other schools. At the village Boarding School at Bolpur, of which the famous Bengali poet Rabindranath Tagore is the presiding genius, the same simple open-air regime is as far as possible adopted, only there in the absence of spreading trees most of the teaching is done in verandahs. Rabindranath Tagore himself was enthusiastically in favour of the effect of open-air education, both on the physical and the mental development of his students.

Surely education under such conditions is more in keeping with the traditions of an Eastern country, and yet it would seem that the general tendency on the part of educational authorities up to the present, has been in favour of the more or less closed buildings. I have heard of inspectors who have actually forbidden classes to be held in the open air.

For schools where plenty of money is available, it is easy to obtain in infinite variety, adjustable shutters, partitions, and windows which will ensure protection against the elements, whilst affording open-air conditions whenever possible. For buildings of a simpler kind it would in many climates be quite suitable to have the walls only reaching partly to the roof, which latter, overhanging so as to afford protection against rain, is supported upon iron or timber uprights. We have thus in fact a glorified imitation of the healthy type of mud hut seen in many village districts of India, where the sloping

roof, usually of country tiles, is supported upon a bamboo framework; the walls of mud being filled in later, but not reaching up to the level of the roof.

For schools in villages and small towns where it is desired to have open-air conditions together with protection from weather when necessary, it would seem that the use of the triple horizontal shutters or "bastas," so often used in the shops and front rooms of Punjab houses would be suitable. These shutters, which normally rest hidden upon a ledge above, are lowered successively when needed, much after the manner of the windows of railway carriages. They are simple, do not get out of order, and could easily be made lighter than those in ordinary use.

It is in Burma that school buildings are to be found both in cities and villages, which do seem to have been planned in accordance with the open-air principles above expressed. Here the larger institutions in towns are constructed either of "brick-nogging" (panels of brickwork with timber framework), or entirely of timber. Often the ground floor is in the former style and the upper story of timber. In either case this style of building lends itself to the sub-division of walls into separate panel areas, some of which may be closed but very many left either entirely open or provided with venetian or louvred shutters. The village schools are built with timber framework, and with strong bamboo mat walls, which are divided into panels that can be opened and raised (supported on bamboo uprights), or lowered, as conditions of weather, wind and sun may require. The one distinctive feature which is thus gained is that of adaptability to varying weather conditions, and I believe that over the greater part of India, except where the expense of timber is quite prohibitive, a somewhat similar style of architecture for school buildings could be introduced with the greatest possible advantage.

For dormitories, especially in those for girls, the necessity of protection against intrusion must be provided for. In rooms of the style mentioned above whose walls are only partially built up, the space above can easily be protected by iron bars or open work of some kind or other. In most of the larger schools the dormitories are on an upper story, when the problem is simple; when

such upper story dormitories have broad spacious verandahs, the conditions are ideal. All over India there are scattered schools whose principals glory in the fact that all their scholars sleep in the open air practically all the year round, and whether in the warmth of the South or the bitter cold of the Punjab winter, they never complain of chills and rarely catch cold. On the other hand, in schools tenfold more numerous, those in charge are afraid of the risk:—"The children catch cold as it is; what would it be if we did not take care to keep them in the warm at night?" I was at a school recently where over 200 pupils sleep inside rather crowded dormitories, because the principal shared the common belief that a locally prevailing North wind was the cause of paralysis. The only ground for the belief seemed to be the case of a single child who had suffered several years previously from paralysis, apparently of the ordinary infantile type, which the relations had attributed to sleeping in the North wind.

Of course common-sense is needed. For those sleeping in the open air bed-clothes must be given more generously; in the case of little children it is better to depend on very warm night clothing, as they are so apt to throw off their bedding. In almost all cases protection from dew is needed, but any form of roof covering is sufficient for this; while if there is wind, or the cold on the unprotected head is feared, woollen balaclava caps are cheap and comfortable. There are in some parts, especially in South India, special prevailing winds, sometimes from the sea, sometimes from the land, sometimes over rice fields, which have a local evil reputation as causing disease. In almost every case the real factor of danger which needs guarding against is change of temperature, and this can be done by care as regards bed-clothing.

In many schools the spacious flat roofs could without any very great outlay be converted into magnificent open-air sleeping accommodation by the addition of a light roof upon iron uprights, and with suitable protection on the "weather" aspect.

Scarcely anywhere are the conditions under which education is carried on more unfavourable than in many of the day schools for little girls in crowded cities. On

account of considerations of purdah, such schools are as a rule held in houses in the bazaar, and as these are usually only rented for the purpose, no attempt is made at even adapting them to the purpose for which they are used. Dreadfully overcrowded, with mud-floors continually rubbed into dust by the movements of the children, a proportion of whom will frequently be found to be suffering from tuberculosis, these schools in many cases most urgently call for improvement. It would often be in the power of local authorities to obtain such buildings on lease or by purchase, and with comparatively little expense to fit them for the invaluable work for which they are needed. Even a layer of linoleum in place of the usual worn-out *chitai* would greatly lessen the ever-present dust.

To conclude this rather long section I do not advise the impossible, or suggest that existing school buildings should be scrapped and rebuilt. I do urge, however, that the open-air principles advocated may be borne in mind in future projects for new buildings, or enlargements of existing ones, and that Government officers in general, and educational authorities in particular, may show in every possible way that they view with favour the tendency to forsake the Western type of school buildings with which the efforts of the Public Works Department have been in the past associated, and to revert to the more open style of architecture, of which the audience halls of many an old Indian palace present such excellent examples.

In the volume of descriptive illustrations of Educational Buildings issued recently by the Indian Educational Department, I looked in vain amongst the illustrations of about 140 institutions, and throughout the letterpress, for any hint regarding schools of the type which has been suggested above.

CHAPTER XVI.

EDUCATIONAL INSTITUTIONS AND THE SPREAD OF TUBERCULOSIS—(contd.)

3. Necessity for Segregation.—The only way of avoiding danger of dissemination of disease when a large number of children are brought together is by exercising the most sedulous care in separating those who may be themselves sources of infection. With regard to the acute zymotic diseases, this is often impossible, as infection may be present before any signs of disease are manifest. With tuberculosis it is not so; it would almost be correct to say that with the care which every properly trained superintendent ought to be able to devote to the matter, it should be possible to practically eliminate the risk of infection in a school. The tuberculosis epidemics of certain orphanages and boarding schools have dated from times when care was not taken to keep consumptive children away from their companions, and as a result the disease has been able to spread freely through the institutions.

Although care is usually taken to segregate any obvious cases of consumption, yet very often this is not done from mere lack of the requisite knowledge. While going over a certain hospital I found in one ward four little boys, all under six years of age. One had suffered amputation, first at the elbow and more recently at the shoulder, for tuberculous disease of the joints, another had extremely advanced tuberculosis of the cervical glands, while the other two were dying of rapid phthisis. On inquiry, I found that all the four children had come from a certain Hindu orphanage in the city, and that the two who were dying of consumption had been during most of their illness together with the other children. On visiting the orphanage I found that it contained 24 boys and 17 girls, and in spite of the evident anxiety of those responsible, to do well by their charges, the ventilation was extremely defective, and a considerable number of the children looked weakly and anæmic, while two or three almost certainly had early phthisis.

It will be asked how in the absence of regular medical inspection, may the principal be able to tell when pupils are developing phthisis. Of course the ideal is for schools to be periodically inspected at regular intervals, and in certain provinces arrangements are already being made for this to be done, while in the case of some of the larger missions the schools in a given area have been placed under the medical supervision of a medical missionary working in that area. Even so, however, especially in the case of girls, the onset is often so very rapid that a patient may reach an advanced stage and be a source of danger to others before the time for a doctor's visit comes round.

What are the warning signals which should put a superintendent on her guard in such cases?

First and foremost, the body weight is a most valuable guide. I would strongly urge that a weighing machine be regarded as part of the regular equipment of every boarding school. I would even suggest that the educational authorities should, where necessary, supply a standard machine for the purpose and insist upon periodical weighing of all pupils.

It must be remembered that in the case of children it is not *loss of weight* that has to be looked for, but the failure to *gain weight* according to the normal progress of a growing child at the given age. It would be quite easy to have charts printed for a year and ruled for say six children on one chart. If then the groups of six were chosen of nearly the same age, and all weighed every month, it would be easy instantly to detect if one of them was not gaining at the same rate as the others. In most schools it would not be difficult to arrange for a regular weekly weighing "seance" for the successive monthly groups, to be taken at the bathing time by a responsible assistant. If this be not practicable, then all the greater watchfulness is called for, to detect loss of weight in the case of any pupils who may seem not to be in perfect health.

Other important points in this connection, are lassitude and disinclination for exercise, loss of appetite, and especially a tendency to slight rise of temperature in the evenings, this latter not being affected by the administration of quinine. When such signs as these exist,

together with a failure to gain weight, even if there be no cough, there is ample justification for suspicion and the obtaining of medical advice. If there be cough also, even if the doctor fails to find signs of disease in the lungs, he would probably advise that the pupil should be isolated from others and dealt with for the time as an invalid. I have recently heard of a case where careful examination failed to find any signs of disease in spite of significant symptoms, and yet within a fortnight afterwards advanced consumption was present, and in two months the patient was dead.

In schools of the ordinary type, the provision of a strictly "open-air regime" for early or doubtful cases will give the best treatment for the patient, and at the same time secure segregation, without the alarming effect of pronouncing him or her at once to be a source of danger to others. There would in early cases be no risk in mixing with others in the open air, so long as close intercourse be avoided while indoors, but special care should be taken to provide separate vessels for the patient's food. For any such doubtful case, pending the doctor's verdict and necessary treatment, there can be nothing but advantage in giving extra milk, and feeding up as much as possible, insisting also upon rest if the temperature still shows a daily rise. Examination work and school study in such cases should be put altogether on one side, and every effort made to restore health before it is too late. This is the stage at which, if possible, the patient should be sent for careful open-air treatment at a suitable institution, and so it is important that medical advice should be sought without delay.

The real difficulty comes when efforts to restore health in the school prove unsuccessful. What is to be done? At most schools now the custom is to send any case of open or advanced consumption away without delay; usually to the patient's home, because there is rarely sanatorium accommodation available. This course means almost certain death, coupled with the risk of spreading the disease in the home; whereas if it be possible for the patient to go to an open-air institution, there is the important gain from the preventive aspect even when there may be little hope of actual cure.

The importance of watchfulness regarding the timely segregation of doubtful cases and the giving of appropriate treatment at the very first appearance of signs of consumption can hardly be exaggerated. I have recently heard of a boarding school where at the doctor's visit 11 girls had to be sent away at one time suffering from consumption. Where marked symptoms were apparent in so many, the probability would be great that further extension of infection may have already taken place.

There is scarcely any need more urgent in reference to the spread of tuberculosis in India than that of the provision of sanatorium accommodation both for incipient and for advanced cases of consumption occurring amongst the boys and girls of schools and colleges. For female students and women, belonging to Mission institutions, limited accommodation is already provided at Tilaunia in Rajputana, Almora in the United Provinces, and Madanapalle in South India, but even for these the need is very far greater than the accommodation. For Bengal girls to be sent for treatment, as has often happened, to Almora or to Rajputana means utter banishment from home, with in many cases the possibility of dying amongst strangers. For male students there is no special accommodation provided, while the existing sanatoria all have long waiting lists, indicating the probability of delay in admission often beyond the period at which there can be hope of cure.

Whilst strongly in favour of the regular medical inspection of schools, I feel that this must necessarily fail of its greatest usefulness, as far as tuberculosis is concerned, so long as the inspector is unable to give practical guidance and help towards securing both segregation and treatment for any scholars found to be consumptive. The medical inspection does not fulfil its full object unless it provides at the same time safety for healthy pupils, and the possibility of treatment under favourable conditions for those in whom signs of disease are detected. At the present time, for the majority of such cases, whether of early or advanced consumption, there is no institution to which they can be sent.

4. Errors as regards Diet.—It is easy to understand that, in the case of growing children an insufficient or

unsuitable dietary would quickly have a prejudicial effect on their health. It is probably not so generally realized that tuberculosis is the one serious disease which more often than any other, except perhaps dysentery, appears as a result of the feeding which fails to nourish. In almost all the schools in which the prevalence of consumption was recognised as a problem of any degree of seriousness it was found that the diet schedule was in need of rectification in some important particulars.

May I say at the outset that I am not alluding to schools of the type of "Dotheboys Hall"! In almost all the institutions visited there seemed to be a genuine desire on the part of those in charge to do the best for their scholars and to make any necessary modifications which might be practicable.

It may be wondered that mistakes should so frequently be made in a matter of such fundamental importance as the feeding of young children. The explanation of such defective feeding lies usually in one of three directions:—

(*a*) Lack of Practical Knowledge as to the needs of Indian children, and the actual food values of various Indian articles of diet. Both in this connection and in regard to other important details of school management, the complaint is sometimes made that persons are placed in charge of schools who have had no special training at all in the management of young children; as if the mere capacity for tuition were considered sufficient to qualify for the management of a boarding school, without any further experience. Such workers, themselves keenly aware of the unfairness of the burden of responsibility laid upon them, may make earnest efforts to avoid mistakes, but it is almost inevitable that the experience gradually gained in such cases, should be purchased at the cost of the health of some of those committed to their care.

The consequence of this freely acknowledged ignorance is that the feeding of pupils is given over entirely to the charge of a subordinate Indian worker, who of course has it in his or her power to make easy and considerable profit out of the daily food transactions. Whatever the amount given for commissariat purposes by the superintendent, the food as it reaches the children

may be reduced in quantity or poor in quality, or, more frequently still, certain important ingredients such as *ghi* may be withheld, while the responsible head of the institution is helpless, not having the requisite knowledge wherewith to test and supervise the working of this all-important department.

Speaking with regard to girls' schools, one of the wisest of women educationalists in India recently expressed to me the strong opinion that every new inspectress or principal of a boarding school ought to have a short period of preliminary work, first at a zenana hospital, and then either in an Indian home or under some recognised authority in school housekeeping, before entering upon responsible charge. I would respectfully press this opinion upon the attention both of the Government educational authorities and upon the leaders of missionary societies in India and in England.

(*b*) The second explanation of mistaken feeding is the very general failure to recognise that it is not sufficient for school purposes to aim at a diet equivalent to that which the child may be supposed to receive at home. There is not the slightest doubt that a child when leading an ordered life under discipline, engaging not only in continual mental effort, but also in far more active exercise than is usual at home, requires nourishment on a different scale to that obtaining under the free conditions of home life. The contrast of environment to which attention has already been drawn, emphasizes the importance of careful attention being paid to the above physiological fact.

This point, that the child at school or the student at college requires a more nourishing diet than that needed during the life at home, has been emphasized by almost every experienced boarding-school manager whom I have interviewed. In many cases it seemed to be regarded as one of the most important lessons which experience had taught in this connection.

(*c*) Actual lack of funds was in not a few cases pleaded as sufficient excuse for really serious deficiencies as regards school dietary. This was especially noticeable as regards the more expensive articles of food such as meat, milk, or *ghi*. The necessity or otherwise of these particular food factors in various climates will be alluded

to later. On the question, however, as to whether or no individuals or organizations are justified in accepting responsibility for the care of more children than they have power or money to feed adequately, the answer on the part of experienced educationalists was very clear indeed. There is always a temptation to increase numbers and accept all applicants for admission. But the question of giving sufficient and suitable food to growing children is one of such vital importance to their health that numbers ought in all cases to be kept well within the limits of the capacity to feed.

The need for a practical and authoritative handbook on school dietaries for India has been greatly felt by many. Such a book would not only deal with the relative food values of the various Indian foodstuffs in general use, and with general questions relating to diet; it would give suggested diet schedules for various classes and ages of students for use in the different parts of the country.

The schools where errors of dietary are most apparent are naturally those where the necessity of reducing expenditure to the minimum is most strongly felt; in the orphanages and in boarding schools for poorer children. The element of error which is of the greatest importance from the tuberculosis point of view has to do with the supply of animal proteins and carbohydrates; and this more especially in the schools of Northern India.

In Southern India, where the climate is uniformly warm, the need of milk is not severely felt, and whether in the home or at school it is often withheld without apparent serious consequences. Even here however, there are many who would regard its use as highly advisable for smaller children, and certainly the addition of milk to the diet of a child who is delicate seems often to be the one thing needed to effect rapid improvement. In Northern India, where there is bitter cold during many months in the year, the need of the fatty and heat-producing constituents of the food is far more acutely felt, and a reduction in their quantity seems very frequently to be a predisposing cause of tuberculosis.

It is with regard to milk and *ghi* that false economy is often exercised by those in charge of schools,

while it is by adulterating or purloining these two articles of diet that the dishonest purveyor makes most of his profits. In many schools in Northern India no milk nor meat is given, and as a daily allowance for a hundred or more scholars, I have frequently found that 5 or 6 ounces of *ghi*, or, where this is regarded as extravagant, an equivalent quantity of oil has been regarded as sufficient. At some such schools where the diet is markedly lacking in fatty constituents it has been found that weakly and delicate children are immediately benefited by the daily administration of a spoonful of sweet-oil mixed with the food. The addition is in such cases most desirable, but a far better plan would be to regard the fact as indicative of a general deficiency in the diet, and at all costs, either by economies in other directions, or by reducing the number of scholars, to supply what is shown to be lacking. Surely it is true economy as well as common humanity to aim at the prevention rather than the cure of disease.

In such cold climates much the same may be said regarding sugar; the children show their need by the desire for it, which is far stronger than in the warm regions of India. The addition of *gur*, coarse unrefined sugar, to the daily diet, or the frequent and welcome distribution of *jalebis*, a sweetmeat consisting almost entirely of sugar in a pure form, is of real advantage.

In certain large Hindu orphanages in Northern India I found no milk at all being given and no *ghi*, only just sufficient oil being used for the actual purposes of cookery. An allowance of 6 ounces per diem amongst a hundred pupils does not give an appreciable amount to each one. Those who argue that boys and girls are usually better fed at schools than at their own homes, often fail to realise that in all but the poorest of city homes, children are continually getting sweetmeats containing both sugar and *ghi*, while in villages, in the Punjab at least, they often have copious draughts of milk.

The times at which school meals are given is a matter calling for careful consideration; many experienced authorities insist on the great importance in

the cold winters of Northern India, of children not being compelled to rise and dress and spend the first one or two hours of the day, without previously receiving some warming food.

A frequent point for criticism of school diets, and one which merits special attention, is that they are too monotonous. Children need variety of food if they are to enjoy it. The ignorance of the foreigner regarding the niceties of Indian diet tends perhaps to make him forget that Indian food is capable of almost as much variety as European. It is not enough, for instance, to regard curry as an unchangeable item, as if there were only one form of it. It is easy to arrange for variety with little or no extra expense; to do so however does require thought and experience. There are some schools where there is no fault to be found with the quantity or the quality of the food materials, but where the manner in which it is cooked and served gives great cause for complaint. Here again the European manager, from pure lack of personal experience, is often helpless, but it should not be difficult to obtain criticism and advice from time to time from disinterested Indian friends.

It is true that tuberculosis is not the only disease with which errors of diet may have a causative connection; this matter is of such importance however, and moreover is one where remedial action is so easy and so imperatively required, that no excuse is offered for dealing with it at some length.

5. Errors in Curriculum.—It is not an infrequent complaint from parents and guardians, that the present course of education as prescribed by the various codes is needlessly severe. Judged by ordinary educational standards however, it would seem that the curricula are by no means unduly hard for boys of average capacity. What makes the burden of education press heavily in individual cases is either the defective teaching given in many schools, or the fact that delicate students are urged to study beyond their strength. The very definite money value which attaches to success in examinations, is responsible for much avoidable overstrain. Educational policy in certain important matters seems in fact to be coerced by the pressure of ill-balanced public opinion. Many of the

chief difficulties are dependent upon the fact that this same public opinion refuses to recognise more than one satisfactory exit from the secondary school course, *viz.*, the University Matriculation examination.

I do not propose to enter upon the somewhat controversial questions regarding the standard of the Matriculation examinations in the case of boys. I would most earnestly urge however that in the case of the few girls who are permitted in India to obtain secondary or higher education, every effort should be made to protect them from the risk of paying the cost in shattered physical health. As matters are at present the results of high school education in the case of many Indian girls are serious in the extreme.

A comparison of the time tables of several boarding schools shows that the girls in the Matriculation classes have on an average at least 5 hours of school work and three more of extra study per diem, giving a day of 8 hours of steady school work. Even so they have in many cases to be restrained from further study before the rising hour. Of course we have to remember that their physique to start with is very different from that of English school girls; the latter are far more robust as a result of constant active open-air exercise and more favourable home conditions. The Indian school girl or college student, especially perhaps in Bengal, tends to be anæmic, often hysterical, and, as I have heard on good authority—in Bengal—shows in many cases a temperature almost uniformly subnormal. This is unfavourable material with which the educationalist has to deal.

Is there no remedy; no change which educational authorities can make, no concession which Universities and public opinion can approve, which will lessen the strain without unduly lowering the standard attained? Something has already been done in this direction. The concession which in some provinces enables a vernacular to take the place of the compulsory classical language is a welcome change; but more is needed. Two further measures of relief have been pressed by many teachers; the first that in the case of girls it may be permitted for the Matriculation examination to be divided and taken in two successive years; the second that as an alternative to one of the present compulsory

subjects, say mathematics, which necessitates hard study and for many girls is not of great permanent value, another more practical subject may be approved. This alternative subject might have a special bearing upon domestic economy; a test essentially practical in nature—needlework, cooking, home hygiene and the like—which would not involve much book work or hard cramming, and the preparation for which would be a relaxation rather than a burden.

For girls who have no intention either of proceeding to the University or of taking up Government service, it is a cruel absurdity to force them through the same matriculation test to which their brothers are subjected. Whatever may be thought as to the advantages of the "school leaving certificate" in the case of boys, there can be no doubt that for girls, the replacement of the ordinary Matriculation examination by a carefully arranged school final, is a change of very real importance. The examination for this, while omitting subjects involving much strain yet of small practical benefit, may include others bearing upon the problems of home life and usefulness. In some parts of India, more especially in the Madras Presidency, Hyderabad, and Mysore, this system has amply justified itself in the case of girls, and it might well be extended and popularized throughout the country.

There need be no doubt that any such changes would be received with great satisfaction by many Indian parents, and they would go far to make the present educational policy more popular. Indian public opinion has taken up education, or rather the passing of examinations, as a great necessity from which there is no escape for the children, since prosperity depends upon it; but the system is not loved. The wiser parents mourn over the severity and also—as they think—the uselessness of the education which their girls receive, and would welcome improvement in any direction. Pending any such change, it is probable that in many cases the chances of success in examinations would be increased and not lessened if the hours of study were reduced and out-door exercise insisted upon, especially if together with this, improvement were possible in educational methods.

With regard to higher college education, there is here special need to urge the necessity of a generous diet with plenty of fresh air. The frequency of failures in health amongst girl college students during or after their course, is such as to suggest the advisability in the interests of would-be students themselves, of making a medical certificate of real fitness to proceed, a necessary condition to entering upon a college career.

Miscellaneous Suggestions.—There are various minor points in school regime which seem to be worthy of mention in connection with our subject and to which attention has been drawn by various experienced workers who have been consulted.

(*a*) **The importance of making the change of environment for freshly entered pupils as gradual as possible.**—In some schools where the importance of what has been urged on this subject above (see page 190) has been realized, those in charge have made a practice of giving a large amount of freedom, especially open-air freedom, to little children or fresh students during their first few weeks at school. They have been lenient as regards hours of study, have allowed them to have milk or other food between meals, and have given opportunities for them to rest in the course of the regular active exercise. The results of thoughtful care in this direction have been in the highest degree satisfactory.

(*b*) **Covering the face during sleep.**—The extreme importance of overcoming this habit has already been urged in the general section on causation (see page 166). A peculiar responsibility in this respect however, rests upon those in charge of boarding schools, since they have the power of forming new habits in those under their care, and thus of spreading those new habits over the country at large.

Here again as in the case of open-air sleeping I found school managers divided into two camps:—

(*i*) Comprising 90 per cent. of the total, who recognized the evil of the habit and were continually making unsuccessful attempts to correct it. The almost invariable report from such was "We go round at night and uncover their heads, but after five minutes it is always the same as before."

(*ii*) The remaining 10 per cent., who have once and for all conquered the habit in their schools, and no longer have any trouble about it, since new-comers and offenders are dealt with promptly by pupil teachers and by their own companions. In such successful schools, I found in almost every case that the means used to effect the change in new-comers was not punishment but ridicule! The problem is solved in this as in many other matters when once the public opinion of a school has been set right.

As a preliminary the two chief causes of the habit must receive attention, *viz.*, cold and mosquitoes. If necessary, girls may knit for themselves light woollen head coverings which will leave the face, or even only the mouth and nose exposed, while boys may be provided with caps with flaps to cover their ears.

As regards mosquitos, at many places in Bengal and elsewhere it is already a recognized necessity for *all* the pupils in schools or colleges to use mosquito netting. It would seem that in those schools where the abundance of mosquitoes is made the reason why this habit of covering the head cannot (with safety from malaria) be combated, the real and obvious indication is to provide the safeguard which elsewhere is found to be essential.

As a means of simplifying this, it may be suggested that two parallel wires stretched along the dormitory or verandah, one at the head and the other at the foot of a line of beds, will obviate the necessity of poles or framework for suspending nets, while in many cases the really efficient remedy is to provide wire gauze so as to convert the whole sleeping space into a mosquito proof cage. In districts, however, where mosquitoes are less numerous, and especially if they are not of the anopheles or malaria-bringing type, sufficient protection will be afforded by the head-covering mentioned above, supplemented it may be by a few drops of an "anti-mosquito" preparation rubbed on the face at bed-time.*

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* A cheap and effective preparation is the following:—
Citronella Oil 2 oz.
Kerosine Oil 2 oz.
Cocoanut Oil 4 oz.
Mix and add acid carbolic 20 minims.

(*c*) **Errors in clothing.**—In some parts of India, notably perhaps in the Central Provinces, it is the fashion for young girls to wear a tight garment ("choli"), a sort of waistcoat, which tends to contract the chest and prevent the child from drawing a full natural breath. Where there is any doubt on this point, it may be easily tested by making children unfasten the garment in question and draw a full breath, keeping the shoulders well pressed back. If now the "choli" cannot be quite easily re-fastened, it is obvious that it is at fault and needs alteration.

The contrast in Northern India between the temperature before, and that after, the sun has fairly risen, and also the diminished power of resistance to chill before the first meal of the day has been taken, suggest the importance of always letting children have some wrap or extra clothing when first they rise in the morning.

(*d*) **Physical Exercises.**—At the larger institutions, those possessing gymnasia and play-grounds, carefully arranged physical exercises and drill have their regular place in the day's routine, quite apart from the ordinary out-door games and exercise. In many of the smaller schools, however, especially those in cities, there is no special accommodation for this and its importance is often overlooked. The value of carefully planned exercises for developing the muscles and lungs is so great that they should never be omitted. The various systems elaborated by Muller and others will serve to give useful suggestions as to what is needed; in some provinces schemes for physical exercises have been drawn up, with special reference to the needs of Indian children.

Parents occasionally object to some of the ordinary exercises of physical drill in the case of girls, as offending against modesty. The grounds for such objections will often disappear if the movements are made not without some article, a flower, fan, etc., being held in the hands. On the other hand the practice of deep breathing is entirely approved by Hindu sentiment, and is amongst many held to have a religious value. If in the case of children, emphasis be laid upon the beneficial exercise of completely filling the chest and then slowly allowing the air to escape, instead of upon the action which may

cause harmful strain, of retaining the breath for a prolonged period, nothing but benefit will ensue.

(*c*) **School desks and the mode of sitting.**—Very much has been written on the subject of the best pattern of desk for school use. Considering the large proportion of time which a child spends in actual study during the period of growth, it cannot be doubted that it is of the greatest importance that this time should be spent under the most favourable conditions as to posture. The secondary schools in India are now for the most part well supplied in this respect, but many of the primary ones, especially perhaps day schools under private Indian management, are deplorably deficient.

Unfortunately it is the little children who are the greatest sufferers. Why it should be thought that they with their soft bones and undeveloped muscles are better able to endure the strain of sitting for hours in discomfort and without support, while older boys or girls need carefully modelled desks with comportable backs, it is hard to say. The fact, however, remains that at a multitude of schools of which the upper classes enjoy the use of furniture of the latest hygienic type, the infant and junior classes have to sit on low backless benches. For the very little ones it is common for them to sit on the ground.

May I suggest for all those who naturally sit either on the ground or on these small benches the adoption of the alternative mentioned above as in vogue at the Satyabadi open-air school (see page 200). Here the children sit upon mats on the ground but have very small slightly sloped benches about 6 or 8 inches high in front of them, upon which they may place their books or slates, or may lean when tired.

Concluding Observations.—Having now noticed various possibilities of danger which, singly or in combination, may have to do with the prevalence of tuberculosis in any individual institution, we may conclude this section with one or two observations of a general character.

On the occasion of any future famine in India, it is of the utmost importance that there should be a most firm control upon all arrangements which may be made for the housing of starving orphan children. It should be rendered impossible, both in the interests of the children

themselves, and of the general community, for such orphans to be removed from their country surroundings and placed in bungalows or orphanage institutions situated in cities. The care of large numbers of orphans is no matter for amateur philanthropy; I have known 45 orphans to be brought away at one time by wholly inexperienced though well-meaning people, and placed in an ordinary bungalow without any attempt having been made to adapt it for so large a number. The results in this particular case were at least as serious as one would naturally expect. In several cases after the last famine where children were—most wisely—housed in rough temporary "chappars" in villages, and retained afterwards under village conditions, no sign of tuberculosis appeared. In other instances, however, where the orphans were brought into existing institutions or housed otherwise in buildings of brick or stone, serious epidemics of tuberculosis ensued, and in spite of every effort to check the disease, it remained for years a source of the greatest possible anxiety to those in responsible charge.

The fact that all over India there are institutions where tuberculosis is more or less rife, where sanitation is defective, and where there are conditions calling for advice and improvement, would suggest the advisability of there being some one whose duty it would be to visit such schools and make suggestions with a view to the remedying of whatever is found to be defective. I know that sanitary matters are supposed to come within the purview of the regular school inspectors, but it is a universally admitted fact that hygienic defects are not as a rule remedied by the existing machinery; nor will they be until expert advice is available.

It would add largely to the usefulness of the work of such an officer were he empowered to make recommendations for summary grants-in-aid for small definite and urgent remedial measures, such as the opening up of new windows, the erection of cheap shelters, or even the provision of extra diet such as milk, where the need is seen to be great and other funds are not available. The possibility of giving such immediate help, of course with all necessary safeguards, but without any lengthy procedure, would be a great advantage and would popularize

the work of such an officer, whose visits to private institutions might otherwise be resented. It would be essential that any proposals to give summary aid in such cases of urgent need should go in the first instance to the local educational authorities for sanction, whatever be the source of the financial assistance recommended.

It is a matter for great satisfaction that in more than one province arrangements have been, or will shortly be perfected, whereby the pupils in all secondary schools will be subject to periodic examination by specially appointed medical officers. The number of such scholars is so enormous however, those in the Bombay Presidency alone numbering over 40,000, that it is scarcely to be wondered at that in any such arrangements for routine examination, the tendency is to pay more attention to the more obvious affections, those of the eyes, teeth, ears and throat, the presence of enlarged spleen from malaria, or of signs of vaccination. It is inconceivable indeed that, with such numbers to deal with, a routine examination could be such as would detect early cases of phthisis, although they would doubtless often serve the important function of finding and separating advanced and infectious cases. In boarding schools, however, it should be possible to do more than this especially if the medical visitor has the co-operation of a watchful superintendent who will be able to bring doubtful cases under his special notice.

The educational institutions in Calcutta, and in Bengal generally, present problems and difficulties peculiar to themselves. They would seem to call for the labours of some true-hearted Indian reformer who should spend his life not only in efforts to effect an improvement in the conditions of study of the 40,000 Calcutta students, but in transforming Bengali public opinion on the whole subject of educational ideals, and the true methods of attaining them.

The conditions under which the Calcutta college student commonly works have often been described. They are exactly adapted for the production of consumptive youths, almost as the carefully prepared medium in the laboratory test tube is adapted for the growth of the bacilli. Very much of course has been accomplished, and there are numbers of hostels wherein the conditions are all that can be desired. But even so the

great majority of students live in hostels or boarding houses under private management, where, over-worked in unhealthy surroundings, underfed, and often without open-air exercise, or any other relief from the dull monotony of the all-pervading cramming system, there is little cause for wonder that the finished product is often neither a very healthy nor a very happy member of society.

It may be objected that in what has been written on the subject of education in connection with tuberculosis, an unnecessary proportion of attention has been devoted to the case of mission institutions. This is partly owing to the fact that the authorities of missionary societies have been as a rule more alive than others to the existence of the problem, and more ready to welcome and even invite friendly criticism and advice. But a still stronger reason is that throughout my inquiry I have concentrated attention where there seemed to be real hope of definite and speedy efforts for improvement. There is a vast area of educational activity over which true reform can only be looked for as a result of a gradual change in public opinion.

I should regret exceedingly if the impression were given that mission institutions compared unfavourably with others from a sanitary point of view. The very reverse is the case. In all matters of efficiency, colleges and high schools which are under mission management, are second to none in the country. If, as regards boarding schools for poor children, and orphanages, it has seemed as if mission institutions have been singled out for criticism, the reason has simply been that in this philanthropic work they stand almost alone. Similar institutions, managed by other religious bodies, are to be found, of course, here and there, and in those which I have seen, it was obvious that the managing authorities have had precisely the same difficulties to contend with. The schools whose conditions have afforded ground for criticism have usually been those established at a time when the principles here advocated were nowhere recognized. Pioneers often stumble in the road which as a result of their own mistakes, is made easy for those who follow.

Part III.

THE PREVENTION OF TUBERCULOSIS IN INDIA.

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CHAPTER XVII.

EXISTING ANTI-TUBERCULOSIS EFFORTS.

Before proceeding to the consideration of various possible measures for the prevention of tuberculosis in India, it will be well to make a brief survey of what has already been attempted in this direction. Sanitary progress in the East of necessity lags many years behind that of Europe and America, and accordingly it has been possible for those responsible for Indian administration to view from afar the somewhat feverish activity, both as regards propaganda and the establishment of new institutions, which marked the early days of the anti-tuberculosis movement in the West.

In the years immediately preceding the war, there was a growing anxiety both on the part of the Indian public and of the Government, that steps should be taken to deal with this problem, the seriousness of which was being more and more clearly recognized. Various local efforts were made, which will be described in due course, but on the part of the Imperial Government there was a reluctance, which subsequent experience would seem to justify, to embark upon large schemes involving heavy expenditure upon sanatoria or other institutions, until their value had been more conclusively established. There was, in fact, a readiness to move forward so soon as the direction of most profitable effort should have been ascertained. Then

came the war, with all its resulting stringency, both as regards finance and personnel, and the share in its hardships which fell upon many sufferers in India, was that the relief which might have been afforded to them was of necessity delayed. Even now the position is scarcely one of calm, but we may surely regard a future period of prosperity and reconstruction as sufficiently near to justify our making preparations for its advent.

We may divide existing anti-tuberculosis measures into—I, Institutions, and II, Educational Efforts:—

I. INSTITUTIONS:—(*a*) **Sanatoria.**—The only institution of this kind carried on under Government auspices is the King Edward VII Sanatorium at Bhowali in the Kumaon Hills, about 8 miles from Nainital in the United Provinces. This was established in 1912 as a result of large subscriptions throughout the United Provinces. It has been assisted by substantial grants-in-aid from Government, and has had the advantage from the first, of being under the superintendence of an officer of the Indian Medical Service. For the first six years it was under the very capable charge of Lieut.-Colonel A. Cochrane, I.M.S., and since 1918, under that of Captain R. K. Kacker, I.M.S. The institution has accommodation for 63 patients, of whom 11 are Europeans and 52 Indians. Of the latter, 20 are entirely free, the remainder having to contribute from Rs. 20 to Rs. 50 per mensem towards their support.

During the last 3 years, accommodation for 100 additional patients has been provided for consumptive soldiers invalided from the war. The expenses for these have been met by a capitation grant from the Military authorities.

During 1918 the total number of civil in-patients treated was 130, and since its commencement, up to the end of that year, 750 patients had been received.

The sanatorium is beautifully situated in the midst of extensive pine forests ; it is at an altitude of 6,000 feet, and the rainfall (mostly during the months of June, July, August and September) is heavy, amounting to over 70 inches per annum. This is not found to be disadvantageous to the patients, but it is advised that, owing to the altitude, only those patients should come

for treatment whose temperature does not rise above 100 and whose pulse rate during rest does not exceed 110.

The institution compares favourably with the best of its kind in the United Kingdom, but it can only accommodate about one-third of those who apply for admission. It owes much to the co-operation and advice of Lieut.-Colonel Sprawson, I.M.S., until recently Professor of Medicine at the King George's Medical College, Lucknow.

At Almora, in the same region of the Himalayas, is a smaller sanatorium, established under Mission auspices in 1908. It was for many years under the charge of the late Dr. Mary Pailthorpe, of the London Missionary Society. It has 30 beds, is well situated and efficiently managed, and is especially intended for Christian women; since its commencement over 350 in-patients have been treated. The allowances for the Medical Superintendent and Head Nurse are covered by a grant from Government; the institution was originally supported by contributions from various Missionary Societies, but these have largely fallen off during the war, and it is at present in serious need of financial aid. The present Superintendent is Dr. J. M. Gray, and the Hony. Secretary is Miss Shepheard, M.B., of Almora, to whose energy the sanatorium owes much of its success from the beginning.

A third Himalayan sanatorium, and the first to be established under Indian management, was opened in 1909 at Dharmpur, in the Simla Hills near Kasauli. Its inception was due largely to the munificence and personal interest of the late Mr. Malabari, and since his death some difficulty has been experienced in obtaining adequate financial aid. The institution has been from the first under the management of the Consumptive Homes Society of Bombay, and receives no regular support from Government. It has accommodation for 50 patients, of whom 10 are received free of payment ; the admissions number about 120 per annum, and are mostly from the Punjab, but here also the applications for admission are far in excess of the available accommodation.

A sanatorium which is to accommodate 50 patients has very recently been opened at Parel, close to Bombay,

in connection with the King George V Anti-Tuberculosis League, and as a result of a generous donation of two lakhs of rupees from the Western India Turf Club. This will be carried on under the auspices of the League, with the help of grants from the Bombay Government and Municipality, and there is every reason to expect that it will help to supply a very urgently felt need.

The only sanatorium in South India, and perhaps now the largest and most successful in the country, is that at Arogiavarum, near Madanapalle in the Chittoor District. For some years this was carried on at Madanapalle itself, on the simplest lines, the accommodation consisting of little more than a carefully arranged collection of matting huts with roofs of thatch. Under the sympathetic and efficient management of Dr. Louisa Hart, it became very popular, and in the year 1915 it was moved to its present position where extensive and most suitable buildings had been erected. A generous grant towards building was given by the Madras Government, which also gives an annual grant-in-aid of Rs. 10,000 towards running expenses. It is carried on as a "Union Mission Sanatorium," and is primarily intended for Christians, but many others are admitted. During the year 1918-19, the total number of patients admitted was 258, of whom 136 were Hindus or Mahomedans; while from its establishment in 1912 until May, 1920, no fewer than 1,401 patients had been admitted.

This institution is situated in fine open forest country at the foot of a range of low hills, and while it is so far raised above the surrounding district as to be about 10° cooler in temperature, yet it has in my opinion the great advantage over the hill sanatoria, of a climate fairly approximating to that of the localities from which the patients come. This I believe greatly lessens the risk of relapse on returning to their homes after treatment. The present Superintendent is Dr. C. Frimodt Moller (Copenhagen), and the working of the sanatorium is thoroughly efficient.

An open-air institution to which unstinted praise can be given is that established in 1906, at Tilaunia, near Ajmere, Rajputana, by the American Methodist Episcopal Mission. It is especially intended for the

accommodation and treatment of girls found to be suffering from tuberculosis in the numerous boarding schools and orphanages connected with that Mission in Northern India, and it represents a courageous and most wise effort to deal with a problem of which much has already been said in this book. Girls from other Mission schools are also received. The buildings and other arrangements here have been of the simplest possible description without any sacrifice of efficiency, but a somewhat extensive new construction scheme is even now in progress, which includes an administrative block and additional wards, one of the latter being for Hindu women. It is greatly hoped that financial aid for these extensions may be granted by the Local Government.

A specially important feature in this institution is that special arrangements are made for the reception and careful segregation of *advanced* cases, who are welcomed, instead of being discouraged from coming, as in ordinary sanatoria. The decision to receive cases of advanced consumption from Mission schools or colleges (thus saving them from becoming sources of risk to others) is an eminently wise one. Mrs. Keisler, M.D., of Muttra, of the above-mentioned Mission, has been from the first a moving spirit in connection with the Tilaunia Sanatorium, but the present Medical Superintendent is Miss C. I. Kipp, M.D.

A smaller institution, also for Christian women and girls, has been recently established on somewhat similar lines at Pendra in the Central Provinces near Bilaspur.

At Rao, near Indore, situated on high ground in the midst of excellent climatic surroundings, a small sanatorium to accommodate about 30 inmates was erected a few years ago, largely through the generosity of His Highness the Maharaja Holkar, but for some reason the work in it was interrupted and it has remained unoccupied.

Special accommodation for cases of tuberculosis has recently been provided in connection with Mission Hospitals at Vengurla, Western India, and at Sarenga, Bankura District, Bihar.

There are several other unimportant institutions, some wholly philanthropic in aim, some combining profit with philanthropy, at various centres which possess

a good reputation as health resorts. Such smaller "homes for consumptives" are situated at Poona, at Karla, at Lonavla in the Ghats above Bombay, at Puri and elsewhere. At practically all these sanatoria only those patients are admitted who are able to pay for their food, and in most cases a fairly considerable additional charge is made for accommodation and treatment. It may be said, indeed, that these institutions, excellent as they are, make almost no attempt to provide for the needs of the helpless poor.

Excluding temporary hospitals for tuberculous soldiers recently invalided from the war, there are in all at present throughout India, probably less than 500 beds in institutions specially adapted for the open-air treatment of consumption ; of these only about 10 per cent. are available for patients unable to pay their own expenses for food, etc., while for the really indigent poor, those unable to travel to distant institutions, sanatorium accommodation is practically non-existent.

(*b*) **Tuberculosis Wards in Hospitals.**—For poor patients however, there are of course beds in the medical wards of local civil hospitals, and a satisfactory feature of recent anti-tuberculosis effort is to be seen in the numerous special wards which have been erected in connection with such hospitals. In many of the larger cities where consumption is common, some attempt at least has been made to supply the obvious need of segregation of cases of advanced phthisis from those suffering from other diseases. These special wards take different forms to suit varying local conditions; thus at some places, as at Jabalpur and Cawnpur, we have broad "lean-to" shelters; at others special wards with the window-space largely increased or the walls left almost entirely open ; sometimes "cage" wards of light iron framework and tiled-roof, with or without wire-gauze protection, as in an excellent ward in the Bowring Hospital at Bangalore. In a few instances, such as at the Zenana Mission Hospital, Bangalore, a light structure for the purpose has been erected upon the roof of existing wards, and these give perhaps the most satisfactory conditions of all.

The Government of Bihar and Orissa has recently constructed special wards at Ranchi and Bhagalpur,

and has sanctioned the establishment of similar wards at Bankipur and Chupra. Further, the Bombay Government in its important tuberculosis resolution of February 1920, sanctioned the establishment, as soon as the present financial stringency owing to the war shall be over, of wards for the accommodation of advanced cases of phthisis in connection with two of the hospitals at Bombay (32 beds in all), and also at Karachi, Ahmedabad, Dharwar, and Hyderabad.

In most cases the accommodation provided in the above-mentioned special wards does not attempt to do more than give the requisite conditions as regards segregation and open-air treatment to those exceptional cases to whom it is difficult to refuse admission, either because of their poverty or the severity of their symptoms. In practically every hospital in India there is a great reluctance to admit consumptive patients. Where there is no tuberculosis ward those cases which are admitted must be accommodated in verandahs, or as is usually the case, in the general wards with other patients. No wonder that with increasing knowledge of the infectious character of the disease the number of in-patients suffering from tuberculosis has not shewn any very marked increase. For the *ordinary* cases of consumption found in such numbers in every city no accommodation is provided. The provision of small tuberculosis wards in civil hospitals will not affect them. They must continue to suffer and die in their homes until measures on a far larger scale are devised for their relief.

It is an astonishing and even discreditable fact that in those centres where the need is greatest such special wards for the treatment of phthisical patients are conspicuous by their absence. This is the case as regards the Presidency cities of Bombay, Calcutta and Madras, Hyderabad, and such great provincial centres as Delhi, Lahore, Patna, Dacca and Karachi. It is true that at several of these cities schemes are even now under consideration for the provision of the needed accommodation but these schemes are slow of realization. At Calcutta most commodious and suitable open-air wards were erected some three years ago on the spacious roof of the Presidency General Hospital, but on a recent inquiry I was amazed to learn that, "owing to the

difficulty in getting nurses, and the paucity of medical officers," these wards had not been opened for use. At Bombay, indigent cases of advanced consumption have been sent to the main isolation hospital when its accommodation has not been required on account of plague or other epidemics ; and, more recently, a few have been admitted to the sanatorium opened at Parel.

With these exceptions, however, the fact remains that at these great centres of infection, from all of which cases of consumption are continually being scattered in the village districts surrounding them, one may look in vain for any special arrangements for the accommodation of cases of consumption, whether early or advanced. In the Imperial City, one of the worst as regards the prevalence of consumption, there are no arrangements whatever for tuberculous in-patient cases at the Civil Hospital, any such being advised to go to the hospital for infectious cases. Here the conditions were obviously not such as to encourage patients to follow the advice, there being at the time of my visit only one pauper phthisical patient, and he in a dying condition.

At Hyderabad (Deccan), although the need has been keenly felt, nothing as yet has been attempted except that cases of phthisis are admitted, when accommodation is available, into a large isolation hospital recently erected. In the neighbouring cantonment of Secunderabad a special tuberculosis ward has quite lately been opened in the King Edward VII Memorial Hospital.

(*c*) **Tuberculosis Dispensaries.**—Turning now to institutions for the special treatment of cases of tuberculosis as out-patients, we find dispensaries established at a few of the larger cities, among which may be mentioned Bombay, Lucknow, Lahore, Madras, and Baroda. It is proposed to start one shortly in Karachi.

Of these the first to be established—in 1913—and perhaps the most satisfactory of all, is that at Bombay, in connection with the King George V Anti-Tuberculosis League, and housed in the Sanitary Institute. There is a second similar dispensary in one of the most crowded quarters of the city, and in connection with both of these there are nurse visitors, who have carried on an admirable work at the homes of patients, affording

nursing aid, examining contacts, and giving personal instruction as to prevention of infection and other health matters. During the year 1918, the number of cases of tuberculosis treated at the two dispensaries was 1,215, while nearly 2,000 domiciliary visits were paid by the nurses.

At Lahore the tuberculosis dispensary is under the control of the Health Officer, and is situated in a crowded quarter of the city. Here in 1917, there were 3,011 new attendances, out of which 982 were found to be cases of tuberculosis. At Lucknow, the number of patients during the same year was 630, while at the "Edward VII Memorial Tuberculosis Institute," Madras, which was established in 1917, the attendance during 1918 was 3,057, including 1,314 cases of tuberculosis.

At other centres the special treatment afforded takes the form of a "tuberculosis clinic" on perhaps two days in the week, at the general hospital, with the object usually of carrying out more detailed treatment, such as by tuberculin injections, etc., than can be given in the ordinary out-patients' department of the hospital.

On the whole, it cannot be said that the attendance at these Tuberculosis Dispensaries is as yet very encouraging. The public have not been sufficiently convinced of the value of the treatment given in cases of consumption, or, what is probably nearer the truth, out-patient treatment in these cases, needs, if it is to be of any avail, more patience than the sick person or his friends are usually willing to exercise. In India, it is too often the case that not to cure a patient quickly, is regarded as failure, and rapid cures are not the rule in phthisis!

Good work is however being done, and the value of these dispensaries is very great, even from the educational standpoint alone.

There are various additional anti-tuberculosis schemes of more or less importance which are for the present being held up either on account of the war or from other considerations. Thus at Madras, a large sum of money has been collected as a memorial to His late Imperial Majesty King Edward VII, and has been allocated for use in connection with measures for the prevention of consumption. The scheme, however,

has for some time remained in abeyance, partly because of uncertainty as to the best measures to be adopted, and partly because in some details it may depend upon the rebuilding of the large General Hospital, which also is under consideration. The interest of the fund is now being utilized in connection with the Tuberculosis Institute above mentioned.

In Calcutta the urgent need for preventive measures has long been felt and in a report upon the subject, recently submitted by the Sanitary Commissioner for Bengal and the Health Officer of Calcutta, the opinion was expressed that the subject could only be adequately dealt with by the appointment, as a preliminary measure, of a tuberculosis expert to examine conditions and advise as to what should be done.

As regards Bombay, the Presidency Government has, as above mentioned, dealt with the matter in a way which is at least a good augury for the future. It is greatly to be regretted that up to the present the Corporation of Bombay City seems not to have sufficiently grasped the seriousness of the problem. The Anti-Tuberculosis League recently brought forward a proposal that two unused wards in an existing hospital for infectious diseases should be utilized, partly as a tuberculosis dispensary and partly as in-patient accommodation for consumptive patients. The League was willing to bear the expenses of the adaptation and fitting up of the buildings for their new purpose, but asked the Corporation to provide upkeep to the amount of Rs. 10,000 per annum. This proposal, although it had the strong support of many most experienced medical authorities, was rejected by the Corporation, partly on financial grounds. Meanwhile the Local Government suggest that beyond the 32 beds already sanctioned, the needs of the city call for at least an additional 168 beds, making 200 in all, and express the hope that these may be supplied by the Corporation. This need has been re-emphasized in the last report of the Health Officer.

II. EDUCATIONAL EFFORTS.—As regards organized attempts to spread amongst the people a knowledge of the important facts regarding tuberculosis, and indeed in general activities relating to health education, there

can be no doubt that Bombay has taken the lead amongst the Indian Provinces. There has been throughout the past 20 years, a close co-operation between the Bombay Government and those interested in public health matters —including both those able to advise, and those able to give liberally—such as has not been apparent in other parts of India. In 1903 the *Bombay Sanitary Association* was founded, with the objects of spreading knowledge about health matters and the prevention of diseases; and under the fostering care of successive Governors, and with the enthusiastic guidance of Dr. J. A. Turner, C.I.E., until recently the Executive Health Officer of Bombay Municipality, very much useful work has been done. Numerous lectures on health matters have been given, popular leaflets have been prepared and distributed in large numbers, branch associations have been formed in certain of the towns of the Presidency, and in 1913, a daughter organization, the *King George V Anti-Tuberculosis League*, was formed with the express object of dealing with the one special problem.

When in 1915, the large Sanitary Institute was opened in Bombay, the whole of its lower floor was handed over to the League for use as its Headquarters, and here we find a Tuberculosis Bureau and Museum, and the well-equipped Dispensary, of which mention has been made. The League has progressed actively, taking over the educational work of the parent association so far as its special subject was concerned, and has been a model for similar organizations throughout the country. It is greatly to be regretted that more cities have not followed this good example.

Both in Lucknow and Ajmere, and just recently also in Karachi, similar anti-tuberculosis leagues have been established, and as a result of the lectures that have been delivered, and other efforts, a considerable amount of local interest in the subject has been excited. The *Edward VII Memorial Tuberculosis Institute* at Madras, includes educational activities amongst its stated aims, but I have no information as to what has hitherto been done in this direction. The *South Indian Health and Welfare Association* was inaugurated in Madras in March, 1919, and is already showing signs of marked activity. This association will

doubtless include tuberculosis amongst the subjects comprised in its educational programme, but so far its efforts have been directed rather specially towards the important and closely allied objects of improving maternity conditions and promoting child welfare throughout the Presidency.

A still wider influence, all in the same satisfactory direction, may be expected from the *Maternity and Infant Welfare Association*, inaugurated by Her Excellency Lady Chelmsford at the highly successful Exhibition held at Delhi in the spring of this year, 1920.

In the Punjab, *The Society for Promotion of Scientific Knowledge*, has been for many years doing very valuable work in popularizing health knowledge, including most definitely the subject before us. Promoted originally by a band of keen young Indians, and with comparatively little financial aid from outside, it has succeeded in a remarkable way, by lectures, leaflets, a monthly periodical and other means, in spreading sanitary knowledge not only in Lahore but in other towns of the Province.

The St. John Ambulance Association includes as an important part of its extensive work, the training and examination of candidates in First-aid and Hygiene, but so far without any especial emphasis upon Tuberculosis.

The above comprise, it is believed, the principal organizations throughout India, aiming at the diffusion of information amongst the people regarding health matters generally, and tuberculosis in particular. Up to the present nothing of the kind has been attempted in Burma. It would not be fair however to close this section of our subject without making mention of the very numerous individual schools and colleges, the authorities of which are keenly interested in the subject, and ready to seize any opportunity of imparting health knowledge to their students, and also the various societies and social service leagues, such for example as the "Social Service League," or the "Sewa Sadan," of Bombay and Poona, which while not directing their activities with any special reference to tuberculosis, are yet engaged in dealing with some of the problems most intimately concerned with its prevalence.

To conclude this survey of existing anti-tuberculosis efforts, we may say that the conditions throughout India are suggestive of a gradually increasing unrest on the subject of tuberculosis, both on the part of medical men and the general public, and an increasing anxiety for the promotion of preventive measures, restrained often, however, by doubts as to what is the best direction which such measures should take. Recent pronouncements as to the comparatively small proportion of cases of cure reported from some of the largest of the home sanatoria have created a degree of distrust of these institutions, the benefits of which were at first so loudly vaunted, and there is a not unnatural reluctance to expend large sums of money in schemes as to the advisability of which there can be any reasonable doubt. On the other hand there is real activity in various directions aiming at the spread of popular education in matters relating to public health, including the subject of tuberculosis.

CHAPTER XVIII.

MEASURES FOR THE PREVENTION OF TUBERCULOSIS IN INDIA.

We have considered in some detail the prevalence and causation of tuberculosis in India. There remains the question of remedial measures. Various suggestions have already been made in preceding chapters of this book, aiming at the removal of causative factors, or the improvement of conditions which seem to tend towards the spread of tuberculosis. We have now to discuss the practicability of any schemes of more general application which may aim at the lessening of the disease throughout the country.

We may say at the outset that over-sanguine expectations of accomplishing anything immediate or dramatic can only end in disappointment. The evil is one of such stupendous dimensions, and it depends upon social conditions so universal, and upon habits and customs so deeply ingrained in the lives of the people, that a long period might well elapse before any very obvious result were apparent. A lifetime and a fortune might be spent in the attempt to clean up a single city bazaar ! What we have rather to aim at is to set in motion certain new tendencies and efforts which may result in a gradual enlightenment of public opinion, a levelling up of the standard of sanitation throughout the country, and a steady improvement of the conditions which have been pointed out as contributing towards the spread of the disease.

In spite, however, of the magnitude of the problem and the difficulties which it presents, there is every ground for the belief that very much may be done and should be attempted without delay. We are on the threshold of far-reaching changes in the internal administration of the country, changes which may in an

especial degree affect matters relating to medical and sanitary progress, since these subjects are amongst those to be "transferred," and will thus come more directly under local and Indian control. There are very many, even of those who are optimistic as to the general outlook, who consider that the changes will inevitably result in a certain—temporary if not permanent—lessening of efficiency. This will assuredly depend in great measure upon the extent to which the experience of the past is permitted to guide and moderate the enthusiasm of the present and future. Mistakes are bound to occur, but progress, even with mistakes, is preferable to stagnation.

As to measures which may seem advisable with a view to limiting the spread of consumption the present is by no means an unfavourable moment for their consideration, since many who are keenly interested in matters of social reform will be having new responsibilities entrusted to them, and Indians may well be willing to initiate changes for the welfare of their country, which they might resent, were these to be pressed upon their acceptance from without.

There is one consideration that has many times forced itself upon my mind in connection with projects for improvements and reforms in India. It is this, that while in England the saying is often true, that "The good is the enemy of the best,"—as when a mediocre method or performance is permitted to hold the field to the exclusion of what is far better—yet in India the converse is also often true, that "The best is the enemy of the good." Ardent souls, whether Indians or Europeans, admiring the perfected methods and ideals of England or America, and anxious to give nothing less than their best, would often plant these highly organized methods out here in unprepared soil, and when failure results, are quickly discouraged and relinquish further effort. We may surely go forward step by step, and yet keep a steadfast look at the goal at which we aim. The introduction of changes too rapidly often results in retrogression.

So much has been done and written in the United Kingdom during the past few years with reference to the

prevention of consumption, that all who possess any knowledge of public affairs are more or less conversant with the measures considered there to be of value. The questions which we have to decide are, on the one hand, whether the schemes reckoned advisable in Western countries are suitable for adaptation to Eastern conditions, and on the other hand, having regard to the enormous population involved, and the resources available of men and money, whether it is in any degree possible to apply the methods of the West to the problem as it exists in India.

The pigeon-holes of many Indian offices contain reports and schemes whose main defect has been that of being too perfect for adaptation to actual conditions out here. The elaborate system of correlated institutions, developed with such skill by Sir Robert Philip in Edinburgh, and imitated in scores of other centres, presupposes an attitude on the part of the public, and a supply of workers and money, which India can scarcely hope to command in less than twenty years.

Turning now to the consideration of practical measures of general application, we have at the outset to recognize the unfortunate effect of the war, with its result in diminishing the supply of financial aid both from public and private sources. For some proposals already made or now to be suggested, it may be felt that even now the time is not yet favourable in view of political and industrial unrest ; for others there is urgency sufficient to dictate immediate action, be financial conditions what they may, while there is much that can be done by utilizing available resources, and regarding which there need be no thought of delay. In fact the present difficulty of financing great institutions or schemes requiring large sums of money, should urge us to be the more ready to go forward with what is practicable under the present circumstances.

This portion of our subject divides itself somewhat naturally into two principal parts; we shall accordingly consider in turn, firstly, **Educational Measures** for the prevention of consumption, and secondly, **Institutional Measures.**

There are certain matters of importance, however, which may conveniently be discussed before passing on to the two classes of measures above mentioned, although it is not for a moment suggested that they should have any priority in order of realization.

(*a*) **Compulsory Notification.**—One important measure which is usually regarded as an essential preliminary to any useful efforts towards the prevention of tuberculosis is that of compulsory notification. The argument is as follows—"There must be accurate knowledge of an evil before it can be successfully attacked, and compulsory notification of tuberculosis presents the only method of obtaining accurate knowledge of its prevalence."

It is my strong belief, confirmed by the unanimous opinion of scores of Indian medical practitioners whom I have consulted, that the introduction of compulsory notification in India at present would be the greatest mistake; its first effect would be to unite solidly against us the very body of men whose co-operation is most essential, the members of the indigenous medical profession. These would be forced into opposition by the strong disapproval of their patients. In India the bond uniting doctor with patients is far more slender than in the West, the medical attendant being frequently changed again and again in the course of a single illness. Consumption is so much feared nowadays in Indian homes that there is a great tendency to conceal its advent, thus the family doctor notifying a case would do so often against the wish of his clients and would lose them at once. As a matter of fact notification in India as far as private practice is concerned may be regarded as almost non-existent.

In Bombay tuberculosis has been a notifiable disease since 1903. The various members of the staff of the Health Department have to report cases coming under their notice, and moreover under the Act medical practitioners are "compelled to notify and are paid a fee for each case notified." What measure of success has been reached in this city, which has been the pioneer in many matters relating to the prevention of tuberculosis? In 1913, the number of notifications of phthisis received was 84, the total number of deaths from tuberculosis

recorded in the year being 2,152.* As a matter of fact the health authorities of Bombay have now abandoned the use of the word "compulsory" in this connection, since in practice compulsion has been found impossible. The system now in force is a voluntary one.

A further advantage claimed for compulsory notification is the opportunity afforded for domiciliary visits, with the object of giving any needed medical assistance; or of taking precautionary measures against infection. It is obvious, however, that as matters now stand in Indian cities, just those cases would be notified which are already under medical care, and in regard to which it might be assumed that the necessary precautions would be taken. Cases occurring in city bazaars, or crowded chawls, the real foci of the disease, would escape notification.

Sir John Simon once said "Compulsory regulations do not make sanitation more acceptable to the people;" and in India, where every form of compulsion carries in its train the possibilities of unlawful oppression by subordinates for the purposes of gain, it becomes of special importance to reduce this feature in our campaign to the smallest minimum. We must recognise the advantage of notification, *i.e.*, of obtaining early information of cases of the disease, but must rely upon *vis a fronte* rather than *vis a tergo*; we must organize our machinery for dealing with cases, for helping with advice and treatment those who apply to us, and thus attract voluntary notification rather than enforce it by compulsory regulations.

I may add that, with a single exception, the memoranda from the various provincial Governments regarding my original report, were unanimous in concurring with the above view, that the introduction of any system

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* **Note:**—This gives a proportion of 3.9 notifications for every 100 deaths occurring during the year. For the purpose of comparison it may be mentioned that in Birmingham in 1918, there were 3,245 notifications of cases of tuberculosis and 1,385 deaths, giving 248 notifications per 100 deaths. The ratio for Manchester was 167 per 100, and for Leeds, 176. This contrast may serve to illustrate the great difference that exists between Indian and Western progress in such matters.

of Compulsory Notification would be premature at present.

In coming to the conclusion, however, that public opinion is not yet ripe for any measure of compulsory notification (*i.e.*, by which failure to notify might involve legal penalties), there is yet every reason why the practice of **voluntary notification** by private practitioners should be as far as possible encouraged, especially in the larger cities. This will add to our knowledge of the disease, while preparing the way for universal notification, which is, of course, in the public interest, the end to be desired. The practice, advocated in some quarters, of giving a fee from public funds, to medical men for every case notified, does not seem to be advisable in view of the professional relations of confidence which should exist between doctor and patient.

(*b*) **Research.**—The present inquiry, necessarily superficial since so general in its scope, has indicated many directions in which further information regarding tuberculosis in India would be highly desirable, some indeed where it would seem to be urgently called for.

For the practical sociologist, tuberculosis is everywhere obtruding itself to his notice, either as a result of evils against which he is striving, or as an indication of unfavourable conditions not as yet fully realized.

It is of the highest importance, with a view to remedial measures, that we should have more accurate information on such matters as the prevalence of the disease amongst members of limited or local communities, such as students, workers in various trades. dwellers in specially selected areas, those addicted to certain habits and customs of life, etc., while in dealing with the varied problems of poverty and overcrowding the social reformer is, in the most literal sense, attacking tuberculosis at its root.

For those interested in epidemiological inquiry, there is much regarding, *inter alia*, the relative prevalence of tuberculosis amongst the various races of India, and their respective immunity or susceptibility to it, or the influence of climatic conditions in reference to the prevalence and treatment of the disease, which it would be both interesting and of practical importance

to elucidate. The necessity of obtaining additional statistical information, and of taking steps to improve the character of that already available, has been alluded to in Chapter II.

The bacteriology of tuberculosis in India presents many problems of special interest, some of which have been attacked with marked success by the workers at the Parel Laboratory and elsewhere. The questions raised in the Chapter on Bovine Tuberculosis are perhaps especially worthy of further investigation, since they possess a special relevance for India. May bovine infection be definitely excluded as a cause of surgical tuberculosis in Indian children? Do the cultural and other characteristics of the bacilli found in cases of bovine tuberculosis in India confirm the suggestion that in some cases the bovine disease may have had a human origin?

Another important question which calls for careful research is as to the actual source, and the precise route of infection, in the very numerous cases of children affected with tuberculous cervical glands in India. The importance of confirming or correcting the wide generalizations recently made in England as to the connection between bovine infection and surgical tuberculosis in children, is of itself of sufficient general interest to justify a special inquiry.

Finally, there is in my opinion very much in favour of the appointment of a veterinary expert, possessing such especial experience as to give authoritative weight to his views in order to investigate this one question of bovine tuberculosis and advise Government upon it. A "tuberculin survey" of cattle in selected areas of North India might yield valuable information both as regards prevalence of and resistance to the disease on the part of bovines. The possibility of lessening resistance to infection, or even of introducing infection, by breeding with English bulls needs to be safeguarded by careful inspection, with tuberculin testing, of animals imported for the purposes. Above all, if it is true that tuberculosis is rare in Indian cattle, and that they are more resistant to infection than those of Europe, we need to know what is the reason for this immunity, and whether there is any prospect of being able to impart it by

careful cross-breeding. If it is worth while to attempt to cultivate immunity from rinderpest in this way, why not also in the case of tuberculosis, which not only destroys cattle, but spreads with disastrous results to human beings also?

The above will indicate how wide may be the range of further inquiry, and how valuable its results for the future welfare of India.

(*c*) **Facilities for special training.**—A difficulty which is already being felt as regards institutions for the treatment of consumption, and which, if not removed, might well be an almost insuperable bar to their extension, is the lack of medical men (and women) possessing special knowledge regarding the disease. Both for diagnosis and treatment special training and experience is necessary, and it is of the greatest importance that facilities for the gaining of this should be available in India. The best method of attaining this object would probably be by developing and improving the "tuberculosis clinics," in connection with some of the great hospitals (establishing them where they do not already exist), and by arranging for the routine work at such clinics to be done, under expert supervision of course, by "Tuberculosis House-Physicians," specially appointed from the local medical college. Such appointments (say, for 6 months or 1 year) would afford most valuable opportunities for gaining the necessary experience, and would be regarded as qualifying the holders for future posts in connection with tuberculosis institutions.

It is not, however, only for the expert that especial training in this disease is needed, it is also for the rank and file of the profession. Considering the vital importance of early diagnosis in cases of phthisis, if treatment is to be successful, it is deplorable that medical students should so generally be allowed to proceed to qualification without having received adequate training in either its clinical diagnosis, or its treatment, or even its bacteriology. Such teaching could easily be given at the Tuberculosis Clinics above mentioned, and at the laboratories which should be attached thereto. It can hardly be too strongly asserted, that no medical student ought to reach the completion of his course, without being able to stain and demonstrate tubercle bacilli in

the sputum, and without being familiar with the early signs of phthisis as detected on physical examination.

(*d*) **Legislation.**—There are certain directions in which legislative action may be called for with reference to the spread of tuberculosis.

i. *The protection of localised areas from infection.*—In more than one provincial area the need has been felt and expressed for some legislative means for protecting localities which, owing to the proximity of sanatoria or other institutions for consumptives, may seem to be threatened with infection. Schemes for the establishment of sanatoria have frequently met with strong opposition from local residents in consequence of this dread of infection, and it is reasonable to expect that when new institutions of this kind are permitted in an area already populated, it should only be under conditions whereby the interests of the original inhabitants will be adequately safeguarded.

It would surely be to the advantage of all parties were regulations to be framed providing, in the case of any proposal for the establishment of a sanatorium or hospital for consumptives, that the site and building plans should receive the approval of the Government health authorities, and that the institution itself should be subject to periodic inspection with reference to sanitary arrangements and general management.

It may be added that although the risk alluded to exists and needs to be safeguarded, yet the real nature of it is usually misunderstood, and in an important particular. It is *not* the case that the mere vicinity of an institution containing patients suffering from consumption, involves any danger of direct infection to those dwelling around. I doubt if there is a single case recorded in all tuberculosis literature, where this has even been suspected to have occurred. Infection at a distance, with an interval of even say 20 yards of fresh air, may be regarded as unknown. What is, however, a risk to be reckoned with, is that the fact of a locality becoming known in connection with the cure of consumption, may tempt sufferers to come and settle there; and still more, that patients suffering from phthisis in an advanced stage may come for treatment to the institution, and being refused admission, may

remain in houses or huts near by, and thus the whole neighbourhood may become infected. It is this risk which is real, and of which there are serious instances in India at the present day. It may be found necessary in certain defined areas that are threatened in this way, to introduce regulations providing for the medical inspection and certification of all new arrivals.

In these and other similar directions it is probable that a carefully thought out Tuberculosis Act might enable provincial Governments and local authorities to do more for the prevention of tuberculosis than is at present possible.

ii. *The safeguarding of cattle-breeding from imported stock.*—This has already been alluded to (page 244), and does not call for further remark.

iii. *The improvement of conditions in factories and workshops.*—Whatever the cause may be, it must I think, be admitted that conditions in very many of the mills, mines, and workshops of India are decidedly inferior to those obtaining in most Western countries. And the conditions which call for criticism are in the main *precisely those which make for the active spread of tuberculosis.*

Factories and workshops, as they exist to-day in England, are the product of long-continued gradual development from stage to stage, and the traditions of sympathetic treatment, dating from times when employer worked together, and on familiar terms, with employed, have by no means wholly disappeared with the growth by combination of the great industrial enterprises. For many decades past, factories have been under legislative control, subject to constant inspection by trained officers, and to regulations which cannot be broken with impunity.

In India, on the other hand, as also in Japan, the factory system has been, as it were, imported *en bloc* from the West, and planted down, without many of the restrictions and safeguards which had developed with it in its native soil, and also—it must be added—without the restraints that a Christianized public opinion had imposed.

Steady efforts have been made by Government during the past thirty years, to effect improvement in factory conditions in this country; regulations have been framed by successive enactments, and obedience to them enforced by trained factory inspectors in the larger industrial centres. These measures have undoubtedly been to a very considerable extent successful, while even now a new Factory and Mines Act is under consideration, from which still more may be expected. Legislative action cannot usually achieve much unless it has the support of public opinion, and it is this which must be aroused before further progress can be hoped for.

Extremely unfavourable conditions, for which in many cases restrictive regulations would seem to be needed, are to be found in the small workshops in cities, where such poorly-paid industries as tailoring, weaving, cigarette-making and the like, are carried on, often by women and children. I have myself again and again seen work of this kind being done in dark, crowded hovels or cellars, under conditions as to sanitation which simply beggar description, and which, if clearly realized by the educated public, would surely not be permitted to continue. If anyone doubts the influence of such conditions with reference to the spread of tuberculosis, let him read successive annual reports of the Bombay "King George V Anti-Tuberculosis League," with their accounts by nurse visitors and doctors of the women engaged in the "Bidi"-making* industry in the Kamatipura quarter of that City.

* Cheap Indian cigarettes.

CHAPTER XIX.

EDUCATIONAL MEASURES.

What has been already written regarding the causation of tuberculosis in India will, it is hoped, have prepared the way for the statement that in any preventive efforts the main stress must be laid upon education. The evil, as it exists at present, depends so largely upon ignorance regarding elementary health matters, and upon social customs inconsistent with a healthy "sanitary conscience," that the diffusion of knowledge must accompany attempts at prevention if these are to have any hope of success.

In the sense in which we are using the word, "Education" does not merely mean book knowledge nor the addition of a new subject to the school curriculum; the passing of examinations on hygiene, physiology or first aid is not enough, valuable as this doubtless is. What is needed is something elementary but exceedingly practical; a knowledge which shall aim at influencing conduct and practice in the common details of daily life. There are numberless matters in connection with the health of the community in which public opinion needs to be profoundly modified or even to be created anew.

In most questions of social reform one is blocked by the hopeless barrier of poverty. One needs to increase the wealth of the people before it is possible to effect any great amelioration of their lot. But in India with regard to health questions, we have very far to go before our progress is arrested from this cause. Here it is not the case, as in many other countries, that insanitary conditions are limited in the main to those who cannot afford to improve them. In India it is not so much amongst the labouring classes that consumption and certain other diseases dependent upon unhygienic conditions are most rife, but rather amongst the fairly respectable section of the community, who live under conditions which they have the power, but neither the knowledge nor the will, to rectify.

If we begin by attacking the problem as it exists amongst those who are capable of responding to our efforts, we shall not only be attacking tuberculosis in some of its greatest strongholds, but shall be preparing the way by raising up an army of helpers, for wider, more far-reaching endeavours in years to come.

There would seem to be two main directions in which we may set about an active campaign of instruction in health matters amongst the upper and middle classes of the people, with good hope of success and without any prohibitive outlay of money. One is by utilizing to a far greater extent than has hitherto been done, the general educational machinery of the country as already established, and the other, by taking advantage of the vast potential resources of voluntary effort, which are available throughout the country, and only await the needed stimulation and guidance.

1. Health Education in Schools and Colleges.—It will have been gathered from the preceding paragraphs that in speaking of educational measures with reference to tuberculosis, we are dealing with a subject far wider than a single disease. If we wish really to strike a blow at tuberculosis in India, it will not be merely by having occasional lectures or lessons on consumption, and the avoidance of infection. This book will have been written in vain if it has not made it clear that tuberculosis is one symptom of the greater disease of ignorance, and that we can only attack it effectually by diffusing in the widest possible manner, knowledge regarding the general conditions upon which healthy living depends. The question therefore before us now is as to how far it may be possible to develop the teaching of health and hygiene subjects throughout our schools and colleges in India.

A very great deal in this direction has already been accomplished. Individual educationalists have shewn an increasingly keen interest in the matter, and have in many cases established classes in Hygiene, and (for girls) Domestic Economy, in their institutions. Hygiene has been made an optional subject in many college courses, and Domestic Science, including such subjects as needlework, cooking, etc., is an optional subject in

many of the recently established "school final" examinations for girls.

It is only just to acknowledge that the Educational authorities have shown a very real desire to develop the teaching of Hygiene and other kindred subjects in Government and Aided Schools, and great progress has already been made. Lessons on health subjects have been included in many of the "Readers" in common use; Elementary Physiology is a compulsory part of the curriculum in many schools, while in some Provincial areas, Hygiene is a component part of the course in Science, which is an optional subject for the University Matriculation. As a rule the students are not examined in Hygiene, but have merely to produce a certificate of having passed through a course of tuition in it.

There is, however, reason to fear that in too many instances, the health teaching, as at present given, is not of a very useful or practical character, and is regarded by the students as being merely one branch of their Science course, having no more direct bearing upon their lives than, say, Geology or Botany.

It is not my intention here to criticise the efforts at health education which have already been made, but rather to press the importance of a very large further development of those efforts, together with such improvements in method as may result in rendering the teaching more practical in nature and more closely related to the actual conditions of life of the people.

Will the need now under consideration be met by an extension of the present system of optional teaching? As things now are, probably not one student in ten, when he reaches his matriculation examination, has even the most elementary knowledge regarding his own body and how he may keep it healthy, or how he may protect himself and others from the illnesses most prevalent in India.

It is my firm conviction that the object aimed at will not be attained by any means short of *the introduction of Health Teaching as a compulsory part of all school education* from primary classes up to matriculation, and

further, that this would represent one of the most important single measures for the prevention of tuberculosis, that can at present be devised.

I would propose therefore that Hygiene or Domestic Science should be made a compulsory subject for the matriculation examination of every Indian University, and that a carefully graduated course of health education should form a part of every school curriculum throughout the country; and that this subject should not be additional to the present compulsory subjects, but should replace one of them.

It cannot be too strongly emphasized that no system of optional or voluntary health education will suffice. The present curriculum is so severe for the majority of the students, and the anxiety, on many grounds, to pass the matriculation examination so acute, that hygiene as an optional subject would have no chance of being chosen unless the examination were made so easy as to be almost futile. So long as the subject is regarded as an optional one, it will be ignored by the vast majority of teachers and students.

This proposal is by no means a new one; it has been favoured by many of those who have shewn themselves most anxious for the real welfare of the people. Special emphasis is laid upon it in notes and memoranda upon tuberculosis from Bengal.

Thus the present Director-General of the Indian Medical Service, the Hon'ble Major-General W. R. Edwards, C.B., C.M.G., C.S.I., K.H.S., when Surgeon-General of Bengal, wrote strongly pressing this point:—

"Poverty we shall presumably always have with us; but gross ignorance can and should be removed. It is very evident that if the whole community were systematically taught the elements of hygiene, things which are permitted now would no longer be tolerated. I refer not only to the gross ignorance of the very poor, but to the gross ignorance of the so-called educated classes concerning the laws of health. The pathetic part is that educated and uneducated alike are so absolutely ignorant of the science of hygiene that they are ignorant of their ignorance: and such are the people

who control municipalities, who control expenditure, and frame laws. For many years I was Superintendent Surgeon of Jammu and Kashmir, where tuberculosis is extraordinarily prevalent, and where the habits of the people, especially in the towns, are filthy beyond description. While there; later on, while Chief Medical Officer of the North-West Frontier Province, and finally since coming here, I have urged the national education of the whole people of India in hygiene. The machinery is in working order and the scheme is so simple that I cannot understand why up to the present time Government has taken no steps towards teaching the people of India the elementary laws of health which are of such vital importance to them.

"Briefly, I should have three text-books on hygiene drawn up for the people, quite a simple matter, and at least one chapter should deal with tuberculosis. These three books should be written for the senior, middle, and junior schools respectively. They should be translated into every Vernacular and taught in every school, and hygiene should be a *subject*—if not the *principal* one—in every examination, more especially in Matriculation Examinations. The answer I get from administrators and schoolmasters is that there are already too many compulsory subjects, and another cannot be added. They entirely ignore the fact that the whole system of general education is merely designed to add to the happiness and wealth of nations, and that the foundation of all happiness and wealth is health. Instead of hygiene being added to a school educational curriculum, it ought to be the very first subject chosen—the *sine qua non* of all education."

Dr. C. A. Bentley, Sanitary Commissioner with the Government of Bengal, speaks with almost equal emphasis to the same effect, agreeing that the education of the public may best be achieved through the agency of the schools; while in a Memorandum from Bengal, a letter is quoted expressing the opinion of the Bengal Government "that a scheme of hygiene instruction was essential if any progress was to be made in guarding the health of the people . . . . . It was further recommended that the teaching of hygiene should form

an integral part of the secondary school course, and that the Calcutta University should be invited by the Government of India to consider the possibility of Sanitation and Hygiene being recognized as alternative subjects for the Matriculation Examination."

The same point is urged in a note by the Director of Public Instruction, Central Provinces, in which he lays special emphasis upon the need of training the teachers : "When the normal school teachers are trained in hygiene, they will be able to instruct the coming teachers, who will thus carry hygiene into the vernacular schools."

At the Annual Meeting last year of the Mohammedan Ladies' Educational Conference, a resolution was presented and passed, I believe with unanimity, affirming the urgent importance of introducing compulsory teaching in health matters into all schools for girls throughout the country. As against such opinions as those given above we find occasional expressions of doubt as to the value of health teaching given in schools on the ground that it is too often regarded—and taught —as merely theoretical, and that it therefore has little issue in practical conduct. Surely this is a criticism of the method of teaching rather than a denial of the value of the teaching itself. In the case of a subject which has such intimate connection with every-day life, as that of physical health, it cannot be impossible to impart teaching it in such a way as to make it practically beneficial. Indeed the contrary has been clearly proved by those who have made the attempt in any serious way.

It is admitted by all that quite apart from the evils inseparable from poverty, a very great proportion of the causes which lead in India to such high mortality from preventible diseases like tuberculosis, cholera, plague and small-pox, spring directly from ignorance. When we have actually in existence the machinery devised for the purpose of dispelling ignorance on the widest possible scale, it is surely reasonable to demand that this machinery—of education—be applied to the most practical and fruitful of ends, that of helping the children and the students of India to grow up with some knowledge of how to keep themselves in health,

and to avoid those things which cause sickness and suffering.

In the meeting of the Bengal Legislative Council of February, 1919, the following resolution was proposed by the Hon'ble Mr. H. R. Irwin, C.I.E., of Kurseong : "This Council recommends to the Governor in Council that provision be made in the coming budget, for the teaching of hygiene and sanitation in all Government and State-aided schools throughout the Province, thereby giving effect to the resolution passed at the meeting of this Council on February 19th, 1918." This resolution was met by what amounted to a *non possumus* reply from Government, detailing what had already been done in the direction of provision for health instruction, and stating that financial and other considerations made it impossible to do more.

The reply of the sanitarian to this attitude of educational authorities is that the latter fail to fully realize the tremendous importance of physical health to the welfare and prosperity of the country as a whole. Did they do so, they would surely be the first to wish to raise health teaching from the subsidiary position which it now occupies in the scheme of education, and give it the prominent place which it deserves.

It is not merely for the benefit of the students themselves that this is needed, but also, and still more, for the sake of those—the mass of the people of India—upon whom the knowledge or ignorance of the educated classes so often reacts for good or ill.

How can we expect to see efficient administration on the part of Municipal Committees regarding city sanitation, building by-laws, over-crowding, and the like, until the leaders of the people themselves possess the knowledge which will guide them? And what is it but knowledge—imparted gradually and continuously in schools, and not by isolated science lectures—which can enlighten public opinion and enable it to decide aright regarding the varied social problems which are calling to-day for reform.

Take for example the case of a village, which like many thousands in India, depends for its water-supply

upon a stream running through it. The village is year by year attacked by cholera, but there is no one to suggest a remedy. The young schoolmaster, who is also in charge of the local Post Office, can give no advice, though he is well up in Persian and algebra! At last he is transferred, and in his place comes another youth who has passed intelligently through a course of hygiene. He sees what is wrong, calls the headmen of the village together, explains in simple terms how cholera arises from polluted water, and persuades them to restrict the upper part of the stream *above* the village, strictly for drinking purposes, using only the lower portion, as it emerges from the village, for ablutions, the washing of clothes, or the watering of animals. The village is saved.

Such instances, affecting towns, villages, communities, families, might be indefinitely multiplied, while on the other hand it is a constant sad experience to hear of young men and girls, who having passed through their school course, at the cost very often of the whole of the father's savings, no sooner pass their final examination—Matriculation or First Arts,—than they fall ill with rapid consumption. Their education, strenuous though it has been, has just lacked that which might have enabled them to retain their physical health.

It is only fair to say that the Government Educational authorities seem to be far more alive to this need than are the Universities. Again and again have proposals been made by various Provincial Educational departments, that hygiene or domestic science should be made an alternative subject for the Matriculation, only to meet with refusal from the University authorities. Until it is included in the Matriculation it is comparatively useless for schools to provide facilities for teaching it. As matters now are in India, the final examination for a student is an event upon which serious financial considerations depend: the value in the marriage market, or the chances of obtaining lucrative posts ; and subjects of study not needed for the examination are simply left on one side.

Of course the change suggested is a drastic one, and curricula as they are at present in force have been

gradually evolved, and have received the sanction of successive educationalists. Yet even so they have had many critics, and it is not too much to say that Indian Universities have failed grievously to win the confidence of the Indian public. The past six years have seen many drastic changes; many methods and policies which would have been deemed fantastic in 1913 are the commonplaces of to-day. Might not the introduction of compulsory health teaching be an innovation which would rapidly and universally justify itself?

Let us for the sake of argument, suppose that under the pressure of public opinion, the proposal was definitely approved, and that Educational and University authorities had to deal with a position which required that in all Matriculation and School-leaving Certificate Examinations, in and after 1925, the subjects of Hygiene (for boys), and Domestic Science (for girls) should be compulsory; and further, that starting with the Primary Department, from January, 1921, and gradually, class by class, during the four years (1921—1924, inclusive), graduated health teaching on thorough and practical lines should be introduced in all Government and State-aided schools, and strongly encouraged in all others. What sort of action would be taken to effect what may seem now so impracticable?

To start with, the rapid initiation of the new teaching in the Primary Department would present no great difficulties, since this—in the beginning at least—would be sufficiently secured by the regular use of one of the health readers which are already available in many areas, and of which the little Punjab Reader, "Life, Light, and Cleanliness," by Lt.-Col. Perry, I.M.S., which has been translated into several vernaculars, is an admirable example. Experience in explaining and developing the teaching given by such readers would of course be acquired later.

Meanwhile expert committees would be deciding upon the courses of study, and arranging the schedules of successive examinations, carefully graduated so as to work up to the Matriculation Standard to be reached four years hence. They would examine the available

text-books for students, and manuals for teachers,* and make arrangements for the translation or adaptation of existing books or the preparation of new ones as might seem necessary.

The courses of study, after the Primary Department, might start on the boys' side with Elementary Physiology, followed by First Aid and Ambulance training, and this again succeeded in the Entrance classes by lessons on Elementary Sanitation and the causes and prevention of the common epidemic diseases. On the girls' side there would first be Elementary Physiology, followed by needlework, cooking and other domestic subjects, and ending with nursing and home hygiene. On both sides every effort would be made to make the teaching practical in character, and to relate it to the home lives of the pupils. And girls should never be allowed to leave the school for marriage, even if before the natural end of the course, without receiving simple teaching regarding maternity and the care of infants.

The preliminary four years would be a time of activity in all the normal schools, and the mere fact of the teachers throughout the country themselves receiving training in health subjects would in itself be a gain of incalculable value. The first step would be to find those who would teach the teachers. Here the services, whether voluntary or paid, of the Indian medical profession would be of great value, and almost certainly widely available; whilst in many centres, equally valuable help on the girls' side might be afforded by Lady Missionaries, medical and lay.

It need not be assumed, however, that tutorial assistance from outside, even for normal schools would be everywhere necessary. There are Manuals of Elementary Physiology, Hygiene, and Domestic Science, so clear and practical, that the senior members of the staffs of normal schools could without difficulty master their details so as to be able to teach; and the same would

* **Note.**—The number of such books at present available—many of them specially adapted for use in India—is greater than may be supposed. The names of a few are mentioned at the close of this chapter.

*

be true of masters in secondary schools. For the latter, however, arrangements might be made for special courses at normal schools or other suitable centres.

There may be details in what has been suggested which may be deemed impracticable, but I cannot believe that there is anything inherently impossible about the proposal as a whole. The organization could not of course be perfected all at once, and the teaching would at first leave much to be desired, but sooner or later the demand (for teachers) would create the supply, and the quality of the instruction given would steadily improve.

There is no doubt at all that the new teaching would be popular with the students, both on account of its variety, and the close connection which it has (unlike the more academic subjects), with daily life and experience, and also because of the opportunities which it affords for practical work. In fact, for the classes of those who teach it as it should be taught, it would afford a pleasant interlude in the day's work, and help to relieve the strain of the curriculum as it is at present.

Finally, it is often said that true education is not the teaching of subjects, but the development of personality, and the formation of character. If this be so, then let us ask, which is likely to be the more fruitful in the formation of character, and to present opportunities whereby the teacher may impress his personality upon his students, subjects such as Geometry, Algebra or dead languages, or those that have been here discussed, with their infinite practical bearing upon daily life and conduct, and the innumerable opportunities which they suggest of unselfish service for others.

The bearing of all that has been urged above upon the tuberculosis problem is that in the forefront of all real Health Teaching would be an insistence upon the value in the home of fresh air, light, and cleanliness, coupled always with the scientific explanation of that value. Thus, we may hope, there will gradually be born in the minds of students that discontent with existing insanitary conditions which is so

lacking at present, and which is an essential preliminary to reform.

LIST OF BOOKS

ON HYGIENE AND DOMESTIC ECONOMY.

(Those specially adapted *for use in India* are marked with an asterisk.)

Manuals for Training Classes and College use.

*Manual of Hygiene and Domestic Economy, Chas. Banks. Macmillan, 1919.

A Text Book of Domestic Economy, Paul. Longmans, 1913.

Practical Domestic Hygiene, Notter and Firth. Longmans, 1913.

*Elements of Hygiene and Public Health, Modi. Butterworth & Co., 1920.

Essentials of Sanitary Science, Brook. Kimpton, 1909.

Science of Common Life, Simmons and Stenhouse. Macmillan, 1912.

*Hygiene and Public Health, Ghosh and Das. Hilton, Calcutta, 1914.

*Tropical Hygiene, Lukis and Blackham. Thacker, Spink & Co., 1918.

*Preventive Medicine and Hygiene, Rosenau. Appleton & Co., 1918.

*Hygiene and Public Health, Parkes and Kenwood. Lewis, 1917.

*Personal Hygiene, Samey. Butterworth & Co., 1920.

For use in Secondary Schools.

*A Health Reader for Indian High Schools, by P. C. Wren, M.A. Macmillan, 1920.

*Hygiene and Domestic Economy for Indian Schools, by Chas. Banks, M.D. Macmillan, 1916.

*The Land of Health and the Land of Wealth: a new Health Story Reader, E. Marsden. Macmillan, 1920.
A Health Reader for Girls, A. L., and E. Stenhouse. Macmillan, 1920.
First Book of Physiology and Hygiene, Cathcart. Macmillan, 1919.
Hygiene for Beginners, Reynolds. Macmillan, 1918.
*Physiology and Hygiene (for Standard IV), Rutter Williamson. Longmans, Green & Co., 1914.
*Outlines of Domestic Science: a Manual for Indian Readers, Lilian Sawtell. Longmans, Green & Co., 1912.
*Personal and Domestic Hygiene, Mrs. Harold Hendley. Gulab Singh & Sons, Calcutta, 1913. (Also in Urdu.)
Longmans' Domestic Economy Readers, Standards 4, 5, 6 & 7. Longmans, Green & Co.
Primer of Tropical Hygiene, Blackham. St. John Ambulance Association, Simla.
Science of Home Life, Nos. 1, 2 & 3, Nelsons.

For use in Primary Schools.

*Life, Light and Cleanliness, Lt.-Col. Perry, I.M.S. Gulab Singh & Sons, Lahore, 1912. (Also in Urdu.)
*A Health Reader for Madras, P. C. Wren. Macmillan, 1917.
*Health Story Reader, E. Marsden, Macmillan, 1918.
Longmans' Domestic Economy Readers, Standards 1, 2 & 3. Longmans, Green & Co.

For Popular use (including Home Hygiene, Nursing, and Midwifery).

*Personal and Domestic Hygiene, Mrs. Hendley. Gulab Singh, Calcutta, 1913. (Also in Urdu.)
*Indian Home Nursing, St. John Ambulance Association, Simla, 1914.
Hints and Helps for Home Nursing and Hygiene, Cosgrave. St. John Ambulance Association, 1914.
*An Elementary Manual of Midwifery (for the use of Indian midwives), Lukis. Thacker, Spink & Co., 1903.

*Maternity and Infant Welfare in India, Ruth Young. Butterworth & Co. (India), Ld., 1920.

*Handbook for Midwives ("Dáyá-gari ke Asul"), Dr. E. M. Brown. Mission Press, Ludhiana (in Urdu and Roman Urdu).

"Sehat-un-Nissan" (Urdu), Dr. Siripat Sehai, L.M.S. Medical Hall Press, Benares.

"Zacha wa Bacha" (Urdu), Dr. R. N. Coorlewala, F.R.C.S. Shamsi Press, Hyderabad (Deccan).

*First Lessons in Midwifery for Country Dais, Balfour. Butterworth & Co., 1920.

Consumption—Home Treatment and Rules for Living adapted for India, Crowe and Sprawson. Butterworth & Co., 1917. (Also in Urdu.)

CHAPTER XX.

EDUCATIONAL MEASURES—II.

HEALTH PROPAGANDA BY MEANS OF VOLUNTARY AGENCIES

WE have dealt with the question of utilizing the Schools of India, so that coming generations may not complete their education without acquiring a knowledge of the principles of healthy living. We come now to a consideration of what further steps may be taken to spread the knowledge of the same principles amongst those whose school-days are over,—if they ever went to school,—the thinking, working, suffering India of to-day.

It is not necessary to further labour the point that the spread of tuberculosis depends largely upon ignorance; the facts mentioned in Part II under the heading of "Causation," have all their significance in this connection based upon lack of knowledge of the laws of health, and it is only by laying a foundation of this knowledge, or—to use a phrase now becoming popular—by creating a "Sanitary Conscience," that we can prepare the way for the future initiation and the willing acceptance by the public of active measures for prevention.

A question of cognate importance which does, however, call for decision at this juncture, is whether in attempting to educate the public regarding tuberculosis, we shall limit our programme of instruction to the one disease, or—in order to better effect our object—aim at a far wider scheme, and include all health matters within our purview. At the commencement of my inquiry it seemed that one primary need as regards the problem of tuberculosis in India was the establishment of a National Association for the Prevention of Consumption on the same lines as the National Association in England, and similar bodies now existing in almost all other civilised countries of the world. This would have had the advantage of definiteness, of being aimed directly

at the removal of one single evil, and could have been naturally affiliated to similar associations in the West. As the inquiry proceeded however, and as I discussed the prospects of success of such an association with various leaders, both Indian and European, I was reluctantly forced to the belief that India is not yet ripe for this, but that what is needed is something more general in character, which might deal with the causes of other diseases besides tuberculosis, although the latter would naturally take a foremost place.

One objection to the specialized association is that its example might very naturally be followed by rival or parallel ones dealing with other prevalent or epidemic diseases. The presence in a locality of several such societies—say an anti-malaria, and an anti-plague, as well as an anti-tuberculosis society—would be neither edifying nor useful, and would lead to confusion and loss of interest. Secondly, there are many considerable areas where tuberculosis is not the predominating disease and where the supply of information as to the prevention of malaria, small-pox, cholera, plague, or hook-worm disease is of even greater importance.

Thirdly, by dealing with the elementary facts of sanitation in their bearing upon health and disease generally, we not only widen the limits of usefulness, but exert more decided preventive influence as regards the special disease attacked. It is becoming increasingly clear that the great decrease in the tuberculosis mortality during the last half century in England is referable rather to the general awakening of the country regarding sanitary matters which took place between 1860 and 1880, than to the specialized campaign against tuberculosis which dated from the late eighties. In India to-day, as regards the popular attitude towards sanitary matters, there is more in common with the early days of sanitary awakening in England, than with those of the anti-tuberculosis agitation.

This point was admirably expressed in a speech delivered by Lieutenant-Colonel S. Browning Smith, I.M.S., at the Punjab Sanitary Conference, 1913, in the course of a discussion concerning the failure of certain "Quinine Societies" which had been established in the

Central Punjab.* I quote the following paragraph from this speech, which exactly expresses what now seems to me to be the true attitude regarding this question of a special Anti-Tuberculosis Association, and I do so the more readily since on first reading it, my feeling was one of strong disapproval :—

> "The point I wish to make is that health societies, that is to say, societies which will inculcate the principles of ordinary sanitary measures,—the value of fresh air, pure water, and uncontaminated soil, the benefits to be derived from proper drainage and conservancy, the care of the infant and a great desire for correct principles of living —will accomplish infinitely more towards the reduction of disease, not only by directly diminishing unfavourable conditions by which various diseases flourish, but by improving physique and increasing resistance to attack, than any number of societies whose energies are each directed against some particular one; the action of such specific remedies as quinine and vaccination would of course take a place among the propaganda of such societies. Doubtless in time as education develops these public health societies might usefully develop more specialized branches, but it is bad policy and wrong in principle to begin with the branch and neglect the parent trunk."

Granted then that we wish to diffuse simple health teaching on general lines, widely amongst the educated classes, and through them to the people at large; how can we best attain our object ? First and foremost we need to enlist on our side all the auxiliary forces that may be available, and we shall find an immense amount of voluntary effort, waiting to be directed and used for the good of the people.

Quite apart from organizations which exist with special reference to health matters, there are a multitude of others, which, whether from religious or social motives, take an active and practical interest in matters

* See Report of Proceedings, Punjab Sanitary Conference (August, 1913), page 56.

that concern the well-being of the people, and which, therefore, may be relied upon to co-operate in any widespread movement in favour of health education.

In almost every city and township there are organizations aiming at the improvement of social conditions amongst the people—societies, some religious, such as the Arya Samaj, the Brahmo Samaj, the Dev Samaj, the Sanatan Dharam, the Prarthana Samaj, or the various local Islamia Anjumans and Hindu Samitis; some more definitely social in their aims such as the Servants of India Society, the various Social Service Leagues, the Depressed Classes Mission and a multitude of others; schools and colleges whose leaders would warmly co-operate with anything for the good of their students; and individuals who realise the possibility of health reform, but as individuals are powerless to act.

Christian institutions such as the Young Men's Christian Association, medical missions, mission schools and colleges, and the Salvation Army have shown continually their readiness to co-operate with efforts directed towards the real social and physical uplift of the people. District missionaries and zenana workers are no less ready to help. There is no platform upon which workers of every religion and race can unite so harmoniously as upon that of efforts for the relief of suffering. Government officials and their wives already do much to shew their interest in questions of social and sanitary reform. They would be ready to do far more, were the way made more easy for them. The army of helpers already exists, it only needs to be organized and enthused for action.

In such organizations and bodies of workers as have been mentioned, we have a great mass of potential energy available for social service, very much of which is at present being wasted, owing to the absence of definite guidance. There is at present no centre to which such organizations can apply either for a programme of service in the direction of health education, or for assistance in obtaining the necessary information and instruction.

Turning now to associations dealing with health and sanitation, there is one which is large and successful,

embracing the whole country, and which might perhaps claim to be able to cope with a need such as that under consideration. I refer of course to the St. John Ambulance Association.

This association has done magnificent service in connection with the war, and would seem to be still working up to the limits of its capacity. Quite apart from the war it has organized classes and examinations all over the country in first-aid, nursing, and stretcher drill, and for such teaching as this there is almost unlimited scope. To add to its programme the immense task of wide diffusion of elementary knowledge such as is here contemplated would be to so over-burden it that neither its present functions nor its new ones would be satisfactorily discharged. The St. John Ambulance Association exists on its peace side for the purposes of enabling a necessarily limited number of men and women to obtain such training and knowledge in medical matters as will enable them to render assistance in cases of sudden emergency, or to supplement the doctor's aid by nursing, or in the management of the sick-room. What is now desiderated is an organization which shall aim at spreading amongst all, the knowledge to enable them to avoid disease and remain healthy. If this purpose is to be realized on any wide scale it must be by means of an organization with a far more simple constitution than the elaborate one of the St. John Ambulance Association.

There remain various other general or local health societies, including some whose efforts are directed against tuberculosis itself, or some other special disease, or for the amelioration of a definite group of unsatisfactory conditions. Many of these have already been alluded to in the chapter on Existing Anti-Tuberculosis Efforts. From one and all of these direct or indirect assistance may be looked for, while the objects of some are of course identical with our own, to lessen the present scourge of consumption.

It has already been urged that the country is not yet ripe for a multiplication of anti-tuberculosis societies, however excellent the work which existing ones are doing. There needs to be preliminary "spade-work,"

the object of which will be to arouse interest and influence public opinion in a more elementary and general way regarding health conditions. From this as a foundation, further specialized associations would arise later, when they would command a far more assured popular reception.

There are two successful organizations, both of which include general health propaganda on their programme. Of these, one is the Bombay Sanitary Association, which has accomplished and is still doing valuable educational work by means of exhibitions, lectures, classes, etc., although its main efforts have been rather institutional in character. The capital funds raised by it were for the most part expended in the erection of the magnificent Sanitary Institute in Bombay, of which the usefulness might be further increased, were it possible to popularize it in some way. Other important extensions of its work have been the "Lady Willingdon Scheme," for providing nurse visitors for maternity and infant welfare work, and a Maternity Home.

The other society is the Punjab "Society for the Promotion of Scientific Knowledge," of which also mention has already been made. This society includes hygiene subjects amongst other branches of scientific knowledge, which it is with much success attempting to spread in a popular form. Both of these societies would supplement in a most valuable way, while yet not rendering unnecessary, the sort of additional effort now to be proposed.

It seems to me that we shall not succeed in making any health organization popular and far-reaching in the sense in which it is required unless it is framed on *far* simpler lines than anything hitherto suggested. The Leagues and Associations in India have been modelled too closely upon Western types ; they have been—for Eastern acceptance—"top-heavy," over-burdened with money and official influence, and with constitutions too elaborate.

To say this is not to deny that they have been successful; they have in many cases accomplished to a remarkable extent the objects aimed at; large sums

of money have been raised, philanthropic institutions of inestimable permanent value have been established, the interest of wealthy and influential men has been stirred, and directed into channels of practical usefulness. *But*—the ordinary people have been left cold and unstirred.

Do we not need an organization which will aim at calling forth, not money but service, and in which all could join on equal terms as members, who are interested in its objects and prepared to take their part in furthering them ?

Such a "League of Health," as it might be called, would exist solely for educational purposes, it would have nothing to do with institutions ; its objects might perhaps be stated somewhat as follows :—

THE LEAGUE OF HEALTH.

Objects.

1. To provide the means whereby the co-operation of voluntary effort with Government administration in matters relating to sanitary reform may be made practically effective.

2. To organize a movement upon the widest possible scale, for the diffusion of information regarding the common preventible diseases, the improvement of domestic hygiene, and especially of conditions relating to maternity and infant welfare, and the raising of the standard of physical health throughout the country.

3. To unite in its membership all who are willing to pledge themselves to make active efforts towards the improving of health conditions in Indian homes, and the correction of personal habits which are shown to be conducive to the spread of disease.

4. To enroll volunteer workers who may be available for active service when required, on the occasion of widespread epidemic disease, or serious local calamity, and to provide opportunities for such training as may make their service efficient.

5. To influence public opinion by spreading information regarding the effects of Child Marriage, the Purdah System, and other social customs upon the health of the community.

6. To establish health bureaus which may be centres for the production and distribution of literature dealing with the subject of the prevention of consumption, malaria, plague, cholera and other preventible diseases, and from which information and advice upon all matters connected with the health movement may be available.

The constitution of such a League would be of the simplest description possible. There would be a President, preferably an Indian social service leader, a Vice-President, a Treasurer, a small Executive Committee, and Honorary Secretaries. The strength of the League would be in its branches, the Central Office existing mainly for publicity work, and the enrolment of members and branches. With the development of a Health Bureau, additional staff would of course be needed to deal with correspondence and superintend the preparation and circulation of literature and material for lectures and classes.

One point of contrast between such a "League of Health" as I would propose, and other organizations of the kind, would be with regard to the membership subscription. In order to emphasize the fact that the primary object of the league is *service*, and not the raising of funds, I would suggest a uniform Entrance Subscription of Re. 1|- for all. There would be no annual subscription so far as the Central League is concerned, although branches might fix a nominal subscription to cover local expenses.

It is useless attempting to attract the ordinary folk as members if we have a high subscription, and it is these whom we must enlist if the League is to be a success. The millionaire merchant will be welcomed as a member if he is willing to make the required promise and give his Rupee. If, as the work of the League expanded, it were found that additional financial support was essential, this could, I believe, easily be obtained by

special donations, leaving the financial constitution untouched.

The membership would be on the basis of a promise or pledge, which might be expressed in some such words as these:—

I promise to study the laws of healthy living and will try to obey them, and will endeavour to persuade others to do so also.

If this promise were printed upon a carefully designed pledge-card, and if upon the same card were given a series of elementary health rules, the membership itself would become an important means of diffusing knowledge in the homes of the people. Such rules as the following might be suitable:—

1. Keep the house clean, light and airy.
2. Keep its surroundings free from dirt and from standing water.
3. Avoid spitting indoors.
4. Sleep with open windows and uncovered face.
5. Keep the body clean and the mind pure.
6. Take regular exercise for the development of the muscles and lungs.
7. Carefully preserve food and drink from contamination.

It would be important that the League should be, as far as possible, non-official in character. This view has been strongly expressed by most of those whose advice I have sought regarding the character of the proposed association. That which owes any part of its success to official pressure is certain to fail when that pressure is removed or slackened. The more this element can be eliminated, and the more all helpers can be induced to do so from a true desire to serve their fellows, the more vigorous and healthy will be the growth of the association.

This does not mean that the movement is to be divorced from all connection with Government; on the contrary its permanence and stability would depend to a great extent upon its being able to enlist the spontaneous and energetic support of Government officials, both Indian and European. In the present state of society in India, a purely private organization, not owing any responsibility to the powers that be, would find it very

difficult to secure and retain that public confidence which would be absolutely essential for its success. But the official connection should be as slender as security would permit and control should be potential rather than actual. The organization would indeed be doomed to failure from the outset, could it not count with certainty upon the practical sympathy and cordial support of officials in every possible way, but this should be accorded by them not as officials, but from a personal desire to co-operate in making the movement a success. In a movement so wholly altruistic in its aims, there could be nothing but benefit in the exercise by district officers and others upon their subordinates of that personal influence which springs from a warm and openly expressed interest and sympathy. The fact that this gentle pressure involves no appeal for money would make it easy for many to use it who might otherwise hesitate to do so, while it would ensure a ready response from those whose help is needed.

Now as to the objects of such a "League of Health." The short schedule outlined above will suggest various directions of usefulness. In the first place, its scope will be frankly *extensive* rather than *intensive*, aiming at spreading its educative influence very far and wide, rather than at giving advanced teaching to individuals.

While every member gained, who really keeps his promise, would be an asset to the League as a whole, yet its success would depend upon those members who throw themselves with enthusiasm into the task of furthering its objects. The co-operation as members, of young medical men, and senior medical students, would be invaluable.

Of vital importance to the success of the League, would be the relations which from the first it might be able to establish with the numerous other bodies engaged in social work in India, the Social Service Leagues, the Students' Unions of Colleges, the Young Men's and Young Women's Christian Associations, the Anjumans and other groups formed in connection with various religious bodies, and all aiming at the social and material (as well as often also the spiritual and mental) uplift of the community.

It would be chiefly as a handmaid to all such organizations that the League would seek to justify its

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existence. Every leader of a Social Service League or Students' Union has to face the difficulty of finding a programme of work:—"What am I to give my men to do?" It will be for the League of Health to supply at least one immediate reply to this question, giving to all who join it the information and stimulus which will send them forward with fresh zeal and equipment to serve *as members of their own organization.*

The Health Bureau would be an essential feature of such a League and would of itself supply a need which is being felt on all sides. Its most important function would be to provide and circulate educational material,—books, leaflets, diagrams, lantern slides, and the like,—for use in connection with lectures or classes, held either under the auspices of the league itself, or by associate bodies such as have been mentioned above.

During the past months I have had frequent applications for pamphlets, lantern slides, lectures and information to enable local workers to do something towards the diffusion of knowledge on health matters. A large number of most valuable leaflets in various languages on the prevention of consumption and allied subjects are already available and useful sets of lantern slides have been prepared. These could of course be added to, and reproduced *ad libitum* and would be at the disposal of those able to make good use of them. Literature containing advice regarding the prevention of infection and the general principles of open-air treatment might be posted free of charge to consumptives or their friends applying for the same. Such a bureau might be a natural depôt and distributing centre of pamphlets or notices, which might be issued under the instruction of plague or malaria officers, and would be a centre to which information regarding popular health matters would gravitate, and whence it would be always available. Every effort would be made to organize lectures to reach various classes of audiences, *e.g.*, students, the general public and especially women. For these latter special literature in simple language might be prepared suitable for reading aloud in homes or at "purdah parties."

An initial need would be the preparation of a booklet embodying the "Laws of Healthy Living" in simple and

comprehensive language, which might be regarded as representing the minimal intellectual "stock in trade," which active members might be expected to possess. Then there would be "occasional papers," or more probably, and far better, a regular "Health" monthly periodical, which would not only record the progress of the League, but would provide interesting and useful information on matters connected with personal and public hygiene.

It goes without saying that all literature issued would have to be in various vernaculars, as demand might indicate.

As has been already stated, this association would not be able to aim directly and immediately at reaching any except those who by reason of their education are capable of making some response. It would be primarily for the more or less educated folk in the cities, those who could live a more healthy life if only they knew how to do so. Is the cry of the inarticulate masses of India to go unheeded? More than all, shall we attack the problem of the cities, and leave the inhabitants of the 720,000 villages, containing 95 per cent. of the population of India, without attempting to improve the conditions under which they exist?

No indeed. The objects of the organization would not be gained by the mere gathering of a host of members. In every vigorous local branch, some members would surely be anxious to do some active service in connection with the league. Let these obtain training sufficient to enable them to become themselves missionaries of health to others, and there is no limit to what might be effected. The training could be obtained in many ways. It is very possible that this would be the point where the League of Health and the St. John Ambulance Association might be able to join hands. Where that was impossible, the local branch might have to organize its own training, but this would not be difficult The poor in a slum and the people in a village could not become individual members of the league, but they could and would respond collectively to appeals aiming at sanitary improvement.

It would be hopeless for any organization to attempt to reach the inhabitants of Indian villages, as individuals. If the village life is to be effected it must be by dealing with each separate village as a unit, and many experiences have shown that this is altogether possible. If groups of keenly interested members were to have villages allotted to them which they could visit from time to time, suggesting improvements which the village as a unit could undertake, we have the possibilities of movement in the direction of sanitary reform, the importance of which might be very great. The element of rivalry as between neighbouring villages is one which might be used with great effect in this connection.

This leads me to lay special emphasis upon the first paragraph of the Schedule on page 269. The value of co-operation of voluntary service with Government in matters relating to public health has scarcely begun to be realized in India. It has been assumed that sanitary administration is the business of Government, and that offers of assistance are not only not welcomed, but may be resented as interference. On the other hand it cannot be denied that Government has not—except in the stress of special crisis or calamities—shewn any great readiness to avail itself of voluntary aid, and indeed has often seemed ignorant of its possibilities.

There can be no doubt that the association of voluntary service with Government measures, especially on such occasions of need as epidemics, famine, great religious and other festivals, etc., is not only of assistance in itself, but it tends to remove suspicion and prejudice on the part of the people concerned. Such help can often be rendered far more effectively by an organized group such as would be represented by a local branch of the League of Health or by the "Health Members" of a Social Service League, than by a collection of individuals without co-ordination, discipline, or training.

Apart from such special occasions, the existence in a town of a body of persons keenly interested in public hygiene, especially if the local medical officer was himself of their number, would be of great assistance in influencing public opinion with reference to such

subjects as local sanitation, social reform, or such more distinctively health matters as vaccination, the improvement of maternity conditions, or child welfare.

Most of all perhaps would such a League justify its existence if it succeeded in attracting to its membership, Indian Government Officials themselves, especially those who, as Revenue, Police, or Forest Officers, or as members of the Educational or Postal Departments, are often the sole representatives of education and authority in a village community. The presence of a single man keenly interested in health matters, and possessing the authority by which he may enforce his will for the good of others, may raise the whole standard of sanitation in a village or group of villages, or may mean salvation to them in times of threatening epidemics of plague or cholera.

We have seen what needs to be done. Whether or not the objects aimed at could actually be effected by some such movement as has been outlined, would depend upon the success of the "League of Health" in enlisting enthusiastic service from its members. And this experience alone can decide.

However the final aim be effected, it will be by the arousal of Indian public opinion regarding health matters in general, that the particular evil of tuberculosis will best be fought.

Note.—The above represents a purely individual conception of what might be the scope and constitution of a movement designed to meet the objects desired; comments upon it, whether by way of criticism or approval, would be welcomed.

Should sufficient evidence be forthcoming that such an organization would meet a real need, arrangements for its establishment will be made.

Communications may be addressed to the author, c|o Post Office, Bombay.

CHAPTER XXI.

TUBERCULOSIS INSTITUTIONS. I.

I. Preliminary Considerations.—In turning now to the discussion of institutional measures for the prevention of tuberculosis, we are confronted with the fact that the present is by no means a propitious time for the launching of large new enterprises, especially of such as call for a heavy expenditure of money. It is essential that we should approach this subject preserving a due sense of proportion as between tuberculosis and other diseases calling for preventive measures, and indeed not forgetting other schemes and projects for social betterment and reconstruction which may either have been held up by the war, or of which the need has only now become apparent in the present awakening of people to see things as they are.

Further, it is most necessary that we should bear in mind the changes that have taken place in medical opinion in the West, as a result of recent experience, both as to the probability of permanent cure in cases of phthisis where the signs are at all well marked, and also as to the value of sanatorium treatment in general. The numerous disappointments in cases stated to have been permanently cured, has modified the earlier somewhat over-optimistic views, which tended rather to minimise the seriousness of the disease, provided that treatment was begun before it had reached an advanced stage.

Institutions for treatment have been compelled by the number of cases of failure, to reiterate their appeals that patients should be sent in the very earliest stages of the disease. It must of course be remembered that in those earliest stages (*i.e.*, before the appearance of the one unequivocal sign of the Tubercle Bacillus in the sputum), there is always room for doubt as to the diagnosis, and this element of doubt tends to exaggerate the number of actual cures of phthisis recorded.

Physicians of to-day, while giving up none of their hopefulness as regards the prognosis in individual cases,

are insisting in a more imperative manner than before on the absolute necessity of taking all possible therapeutic measures at the first beginning of the disease; while those who have the opportunity to do so are urged to treat physical tendencies, before actual symptoms or signs even begin to shew themselves.

The one thing that is certain, since it is continually being proved by the discovery of healed tuberculosis in the bodies of those who have died from other causes, is that for most persons, even if infection takes place, there is a stage when treatment, or altered conditions of life, may probably effect a perfect cure. And improved methods of diagnosis (such as the Roentgen Rays, etc.) are daily helping us to anticipate that stage.

The present tendency of opinion in England is to the effect that while sanatorium treatment is highly beneficial and frequently results in a more or less permanent restoration to health in the case of those whose circumstances enable them to continue under approximately similar conditions after leaving the institution, yet for the poor its value does not justify the heavy expenditure involved, and this for the following reasons:—

1. The disease is in such cases rarely diagnosed sufficiently early for treatment to be of any avail.
2. The tendency to relapse is almost universal, on account of the contrast on returning to the original conditions of life and work.

For the poor then, the establishment of sanatoria is coming to be regarded as on a par with hospitals for treatment of other diseases, and other forms of charitable relief, and not as affording any practical contribution towards the problem of prevention. For this reason, and also on account of the enormous expenditure involved, the establishment of large sanatoria for the treatment of poor consumptives is not here advocated as advisable in India. It may be said that in this respect the cautious delay on the part of the Indian administration has enabled it to profit by experience obtained at very great cost in England.

As regards institutions for the treatment of consumptives other than the very poor, the main financial burden for their establishment and support should be borne by the communities to which they belong, although here, as in all institutions for the good of the people, grants-in-aid from Government are justified and necessary.

II. Sanatoria for Members of the Public Services.— There are certain groups of people, however, whose claim upon the generosity of Government seems to be of a different order to that of the general population. These are the men employed in the public services of the country, as for example policemen; railway, postal, or telegraph employees, or workers in Government offices, or under Municipalities. There are two grounds upon which a claim for differential treatment in their case may be based :—

1. That they are workers for the community, and have in many cases contracted the disease in the course of their work.
2. That they are, generally speaking, under conditions of organization and discipline which would enhance the educational value of the regime, and increase the probability of the continuance of that regime after the period of treatment is over.

As regards members of the Police force, there is direct evidence from various centres to shew that many do actually contract the disease as a consequence of their duties calling them to serve in slum areas of our large cities. The gain would be great indeed if instead of simply turning phthisical policemen back into the general population it were possible to send them for a period for watching, treatment, and health-education to some central institution. This need not be an expensive building; arrangements might be on a very simple scale, the main emphasis as regards treatment being placed upon the open-air regime with good food, every effort being made to put the patient in a position to treat himself and to avoid becoming a source of infection, in the event of its ultimately proving necessary for him to be invalided.

It has been objected that such an institution would not be popular with the force, and that consumptive sepoys would usually prefer to go straight to their homes. To this it may be replied :—

(a) That in any case a consumptive sepoy usually spends some considerable time as an in-patient at the police hospital ;

(b) That the men already dread the disease and will usually embrace with eagerness the best chance of escaping from it; and

(c) That it is not proposed that they be sent there *after* being invalided from the force. So long as they are in the force and receiving pay it would be a mere matter of routine procedure for suspected consumptives to be transferred for a time to the central sanatorium. I feel certain that the establishment of such an institution would be regarded by the Police themselves with the greatest satisfaction.

As regards railway employees, it may be mentioned that these represent by far the largest single class of industrial workers; those actually employed upon Indian railways number upwards of half a million, with more than an equivalent number of individuals dependent upon them. There is ample evidence to prove the considerable prevalence of tuberculosis in their midst, the deaths from which are stated to occur mostly amongst the upper grades of workers—clerks, station-masters, ticket collectors, etc.

It would require on the part of the great Indian railways a combined outlay trivial in comparison with their revenues in order to provide and keep up a tuberculosis institution which would be a boon and a blessing to a large number of people who have contracted phthisis while employed on railways. Such an institution would need to be dual in character, containing accommodation and arrangements suited both to European and Anglo-Indian, and also to Indian patients. There can be no question that a measure showing such practical consideration for the well-being of the railway staffs, would call forth the liveliest satisfaction and gratitude on the part of those for whom it was intended.

The Chief Medical Officer of the Bengal-Nagpur Railway commented in the following terms upon my suggestion that an institution of this kind might be advisable:—

> "I am of the opinion that the establishment by Government of an open-air sanatorium for railway employees—European and Indian—would be a great boon. It is frequently necessary to get these patients out of a climate such as that of Bengal, but the expenses incidental to a lengthy residence in a suitable climate in the hills are far greater than the average railway employees can afford; more especially as many of these cases naturally occur amongst junior men on low pay.
>
> I do not think it is any good making any large provision for menials, as they are not likely to avail themselves of it.
>
> The educational advantage of such an institution would be also inestimable."

The chief medical officers of several other Indian railways have written to me expressing warm approval of such a scheme.

In this as in all institutions for similar purposes in India, I would advise a type of building simple and inexpensive in character, which would lend itself to indefinite extension as the need increased. If this were done, instead of starting at the outset with a very extensive and costly institution, it would be possible to test the demand and the value of the measure proposed without incurring any excessive initial outlay.

III. Hospitals for Advanced Cases of Consumption.—If we regard those institutions as most worthy of support by public bodies, which give promise of genuine results in the direction of *prevention*, then emphasis must undoubtedly be laid on the necessity of establishing hospitals for the segregation and treatment of advanced cases of tuberculosis in connection with the larger cities. There are many authorities who would give this the foremost place in considering institutional measures for prevention.

Dr. Leonard Crossley says with reference to advanced cases of consumption: "These are of course the most infectious cases and it is hopeless to expect to control the spread of tuberculosis unless provision is made for these dangerous cases. In my opinion a hospital for advanced cases should be the first provision made in all schemes for dealing with tuberculosis; unfortunately it is generally the last." *

As regards India, Major-General Sir Patrick Hehir, K.C.B., I.M.S., writes:—

"The establishment of sanatoria for advanced cases is one of the best methods of attempting to eradicate the disease from communities. It concentrates the cases under medical care, removes them from the general communities and saves the relations of the affected from further infection. This has not been carried out in India except to a very limited extent and is capable of very considerable extension."†

The need for such "Hospitals for Consumption" (as distinct from Open-air Sanatoria) has been acutely felt and frequently expressed by the Health Officers of most of the great cities of India. They would rank along with other hospitals for infectious diseases, as institutions which aim at serving the interests both of the individual and of the community.

There are some indeed who would advise the *compulsory* segregation of patients suffering from "open" and infectious phthisis, as in the case of other contagious diseases, but its usually chronic character places it in quite a different category in this respect from the acute infectious fevers such as small-pox, etc.; and it is certain that no proposal in this direction could be seriously considered as applicable to India. As therefore, we cannot compel, there is all the more reason why we should *attract*, and it is of essential importance that such institutions as we are considering should be popular, so that patients may be induced to come, and that the regime and treatment should be such that cases may be willing

* "British Journal of Tuberculosis," April, 1914.

† "Hygiene and Diseases of India," 3rd Edition, page 975.

to remain, instead of coming for the short but futile experimental periods which seem to be in India the rule with those suffering from chronic disorders.

Hospitals for consumption, while situated in open localities, should be within very easy access from the centres of population which they serve. It is important that patients should be able to reach the institution with a minimum of trouble and expense, and that their friends and relatives should be able to visit them freely.

Nothing contributes more to that feeling of "ghabrá-hat," or agitation, which so often sends an Indian patient away from hospital, than the consciousness of banishment, of isolation from home and friends. (In this connection it may be repeated that the danger of infection to surrounding areas from a properly managed hospital of this sort may be wholly ignored. The well-known Brompton Hospital for Consumption has been for over 50 years situated in the midst of one of the best residential areas in London, without there having been the slightest reason to suspect risk from infection.)

A hospital where many of the patients are suffering from advanced phthisis makes special claims upon the sympathy and attention of those in responsible charge, both doctors and nurses. It should be obvious to the patients that they are doing far better for themselves by remaining than by returning to their homes. In such special hospitals, as in the tuberculosis wards of General Hospitals, there is a sameness and a lack of professional interest about many of the cases which may tempt a medical officer to save himself from trouble by resorting to routine methods, stock mixtures, etc. It is of special importance that an optimistic and hopeful attitude should be induced and maintained in the minds of the patients, and this will be impossible without painstaking and *individual* medical attention. I visited one hospital where all the patients were wearing large metal inhalers, and on the walls were printed notices commending their use, and giving as one point in their favour, that "they serve as a continual reminder to the patient that he is the victim of a mortal disease!"

IV. Tuberculosis Wards in General Hospitals.—It is only for the larger cities that we can hope to see

special hospitals for consumptives; for those of a smaller size, however, it is becoming increasingly evident that special ward accommodation for phthisical in-patients should be an essential element in every civil hospital.

Even if it be granted that ordinary cases of consumption cannot expect to be treated as in-patients in hospital, yet cases constantly present themselves for treatment, whose special circumstances of helplessness, or the severity of their symptoms, make it almost imperative that they should be admitted. In the absence of a special ward, however, it is most difficult to do this, whilst avoiding risk of infection to other in-patients. At present it is a very common practice to keep phthisical patients in the verandahs of hospitals where no special ward exists, but the disadvantages of this are obvious both as regards the arrangements of the hospital and the welfare of the patients. If for the larger cities, special hospitals for progressive and advanced cases of tuberculosis are indicated on grounds both of prevention and of humanity, then on the same grounds for smaller towns it would seem that special tuberculosis wards are needed in existing hospitals.

In the Chapter upon Existing Anti-Tuberculosis Efforts we have seen that many of the civil hospitals have already added these special wards for consumptive cases to their existing equipment. Probably, however, not 10 per cent. of the civil hospitals (excluding dispensaries) in India as yet possess separate accommodation for the treatment of cases of tuberculosis, and there can be no doubt that the extension of this plan of adding open-air wards in existing hospitals, would be an easy means of supplying a very real need, and at the same time a measure of great practical importance from the standpoint of prevention.

As a rule, this can be done without any additional expenditure on administrative buildings, and with only a very small, if any, addition to the subordinate staff. The Civil Surgeon will in most cases gladly undertake whatever extra labour may be involved in looking after the additional beds, since he will welcome the opportunity of being able to treat cases of tuberculosis apart from the other in-patients. The efficiency of the whole

institution will be decidedly increased, while the importance from the educational point of view, both for the general public and for the hospital staff, in having consumptives segregated from other patients and under a special regime, is well worthy of consideration.

For the smaller hospitals, probably the simplest form of building will be at once the cheapest and most satisfactory, such as the ordinary "lean-to" shelters, as seen at Bhowali Sanatorium or at the civil hospitals at Jabalpore or Cawnpore. Such open-air shelters, consisting simply of verandahs about 16 feet or 18 feet in depth, can be added to almost any hospital with the greatest ease. Their aspect should be so arranged as to afford shelter from the prevailing winds, but with this proviso almost any compound could give space for one or more wards of this type. In the case of the smaller compounds, a section of the peripheral wall might often be replaced by a tuberculosis shelter. The building itself may be of the simplest construction and of the cheapest materials without any sacrifice of its usefulness, seeing that its essential qualities are that it shall provide so much protection as is necessary, together with a maximum amount of fresh air. The shelters can be subdivided partially or entirely into separate cubicles or divisions as necessity may suggest.

There must be very many small towns which could afford the Rs. 5,000 or even Rs. 10,000 of capital expenditure, which would suffice to provide a ward or wards of this nature, and would greatly raise the efficiency of the local hospital by putting it in its power to deal with cases of consumption in a rational and up-to-date way. Larger cities will surely, now that the need is becoming more generally understood, no longer endure the reproach of making no provisions for this class of cases and will follow the example of those which have been forward in the matter, either providing tuberculosis wards themselves, or at least willingly undertaking the slight expense of upkeep of such wards if offered by local philanthropists.

Apart from the civil hospitals there are a large number of mission hospitals scattered throughout the country, the superintendents of which would most

willingly undertake the responsibility as regards supervision and treatment of an additional number of patients suffering from tuberculosis, if the extra expense involved were obtainable, either from local authorities or from any other source. The necessity of providing for protection and seclusion in the case of city hospitals for women, renders the simple type of shelters above described unsuitable for women in cities, excepting those of the humbler classes; and in fact some of the lady doctors in charge of city zenana hospitals, have advised against the establishment of tuberculosis wards in them, owing to the risk of infection to the nursing staff. This risk is of course decidedly greater in a city women's hospital, on account of purdah restrictions.

In the case of village hospitals, however, no such danger is involved and within six months, were the needed funds available, a very large number of additional beds, both for men and for women, could be provided, at a capital expenditure of not more than about Rs. 200 per bed. In many cases a recurrent grant would be needed to cover the cost of food for patients, but even this would not in all cases be required. Here again the staff and administration is already available, and the additional accommodation would be obtained at a fraction of the cost of establishing a new institution. This plan would seem to be particularly adapted for women and children sufferers, whether in advanced or early stages of the disease, since the conditions of a village mission hospital permit the exercise of more individual sympathetic care than is usually possible in city Government institutions, with their busy rush of work.

V. Tuberculosis Dispensaries.—In a few of the larger centres, as has been already described (see page 232), special dispensaries for the treatment of cases of tuberculosis have been established, and are doing excellent work. In connection with the dispensary there is usually an organization of domestic nurse-visitors, who follow up cases, giving instruction and treatment in the homes of the people, thus supplementing in a very valuable way the work of the institution.

So far, in almost every case, such dispensaries have been established by the Municipality of the city, and have been maintained under the management and control of the Medical Officer of Health. While admitting that in the larger cities, such as Bombay, where it is possible to provide both for equipment and staffing on a generous and permanent scale, this arrangement may perhaps be the best; yet it may well be questioned whether in most centres the wiser plan may not be for all such special institutions to be a part of the ordinary local medical organization, and under the Civil Surgeon's control. By this arrangement it would seem that permanence and efficiency would be better secured, while close relation with the civil hospital gives other advantages, such as facilities for interchange of staff, and for sharing in the equipment of drugs, appliances, etc., of the main hospital. Further, it enables the cases which are found to be non-tuberculous to be at once transferred to the general department for appropriate treatment, while providing special facilities for dealing with the tuberculous cases occurring at the civil hospital itself.

At the same time it has to be borne in mind that for the preventive side of the work, and especially for the control and organization of home visitors and nurses, the close co-operation of the Health Officer is essential. The location of the tuberculosis dispensary at the civil hospitals does not, however, seem to place any insuperable obstacle in the way of such co-operation, and in fact, for many matters apart from tuberculosis, it is much to be desired that the work of the Medical Officer of Health and that of the Civil Surgeon should be more closely co-ordinated than is usual at present. In any case it would surely be a simple and satisfactory procedure for notifications on printed forms, giving details regarding cases of phthisis, to be regularly supplied from the Civil Out-patient Department to the Health Officer. This would enable him, either personally, or through nurse-visitors, to arrange for visiting cases at their own homes.

In so far, therefore, as the treatment of consumptives as out-patients is concerned, I would emphasize the

importance of developing and equipping specialized tuberculosis clinics at existing hospitals, in preference to the establishment of new and separate institutions. In Western countries the tendency is becoming more and more marked to regard the tuberculosis dispensary, less as an institution for treating out-patients, than as a central depôt, or clearing station for the various correlated anti-tuberculosis activities in the area. In India at present these varied activities are practically non-existent, so the necessity of the central depôt is less obvious.

CHAPTER XXII.

TUBERCULOSIS INSTITUTIONS. II.

VI. Open-air Sanatoria for Adults.—While the provision of sanatorium accommodation for the consumptive poor upon any large scale would seem not to be a justifiable object for the expenditure of general public funds, yet for certain limited communities or classes of patients, the need for such provision is very great, and it would form a most legitimate burden upon the philanthropy of the community concerned.

In the case of adults, the most important questions for consideration as regards suitability for sanatorium treatment are firstly, whether the malady is in a sufficiently early stage to permit of real expectation of cure, and secondly, whether circumstances will enable the patient to enjoy moderately favourable conditions of life after the conclusion of the term of residence.

For a young clerk or schoolmaster, threatened with incipient phthisis perhaps after a period of special strain, or as a sequel to an acute illness, a course of treatment at a sanatorium may be the one thing needed for permanent restoration to health, provided that he continues an open-air regime subsequently in his own home. For the really poor, however, a merely temporary change in conditions as afforded by sanatorium treatment, if there is no alternative to a return to slum surroundings afterwards, can be of little lasting benefit, and may indeed be a very doubtful kindness.

The existing sanatoria in India, in spite of the fact that their authorities are constantly narrowing the limits defining those who are regarded as suitable cases, have all of them long waiting lists; lists which may be said to be made up of individuals who see their best chances of restoration to health fading away with the delay in securing accommodation. This surely constitutes a strong appeal both to communities and wealthy philanthropists to provide the means of treatment under the most

favourable conditions, at least for those selected patients for whom there is a real prospect of permanent cure.

The need for additional special sanatoria for consumptive members of the Christian community has been repeatedly pressed by conferences of representatives from the various missionary bodies. (*See* resolutions on the subject from successive meetings of the National Missionary Council.)

As regards the question of the location of sanatoria in India, the earlier views were to the effect that forest environment at a high altitude afforded by far the most favourable climatic conditions. The limitations involved by this opinion may be instanced by the case of one provincial area where proposals for the establishment of a sanatorium were blocked by the professional dictum that no such institution should be situated in India at an altitude of less than 5,000 feet. The province in question did not contain such an altitude!

In consequence of the successful results obtained in Europe in sanatoria under widely differing climatic conditions, as also indeed in India in institutions which have been established at low altitudes, it has been clearly recognised that as a general rule it is the regime which contributes far more to success than any special factors connected with climate. The one condition which is usually regarded as unfavourable is that of high and continued humidity, especially if combined with extremes either of heat or cold. The most recent opinions in England agree that the prevalence of rain-carrying winds constitutes a very decidedly unfavourable climatic feature for the treatment of pulmonary tuberculosis. In the case of some otherwise favourable locations, the presence of dust in the atmosphere constitutes a serious objection. Purity of the air is undoubtedly one of the great assets of a mountain climate, but happily it is not unattainable at low altitudes.

It is evident therefore that in India there are localities where favourable climatic conditions are obtainable within comparatively easy reach of all the great tuberculosis centres, and that in determining the sites for future sanatoria, the important questions of accessibility,

and of approximation of climatic features to those of the area from which inmates are drawn, may wisely receive an increasing degree of attention. There is no doubt that the long journey, involving banishment from home and friends, necessitated by the situation of the distant hill sanatorium, does militate against its popularity, besides adding greatly to the expense, while the psychological effect of isolation, especially in the case of such home-loving people as Indians usually are, is by no means to be neglected.

In selecting a site for a sanatorium, perhaps the most useful general rule that could be suggested would be to choose the most accessible area where the climate would permit of patients spending the largest proportion of their time in the open-air. The climatic features emphasized above, especially as regards humidity, absence of rain-bearing winds, and purity of air, should be taken into consideration, while the soil should be porous, and the area capable of being efficiently drained.

Other important points are (a) *Altitude.*—If a moderate altitude of say 2,000 feet or 1,500 feet, be obtainable within the limits of accessibility, then the slight reduction of temperature afforded will be of real value during the hot season. (b) *Shady trees and other attractive natural features.*—I believe the psychological effect of these to be of great importance, in view of the monotony of the sanatorium life, which is being increasingly recognised as one of its most serious drawbacks. (c) *An abundant supply of pure water.*

VII. Open-air Institutions for the Young.—In dealing with the question of establishing sanatoria for adults, it seemed necessary to make certain limitations as to the classes of patients for whom such provision might be regarded as suitable and desirable. In the case of children, or the youthful, however, there is no need for making any reservation. For them there is every possible reason, on grounds both of prevention and of treatment, for pressing the necessity of providing open-air accommodation for all who need it. The argument based on the result of a subsequent return to unfavourable conditions, does not apply in their case, in view of the great possibility of effecting such a complete cure—often

apparently accompanied by an actual immunity—as will permit of a return without serious risk.

(i) Open-air Schools or "Homes" for Tuberculous Children.—There is no more urgent need as regards our whole problem than that of the provision at suitable centres, of institutions to which those school children could be encouraged to go, who are found to be either threatened with tuberculosis, or actually consumptive. One of the chief grounds upon which the medical inspection of schools is constantly urged is the necessity for discovering and dealing with such children. In the one case the opportunity is afforded of placing those who show signs of the disease in its early stages, under such conditions as will give them the best chance of escaping from the danger, and in the other there is the still more urgent necessity of segregating from their fellow scholars those who may be a source of infection. But just as in the case of defects of eyes or teeth, the medical inspection of schools postulates arrangements for the efficient treatment of those found to be affected, so in the case of tuberculosis, the medical inspection loses very much of its value if the inspecting doctor can give no reply to the inevitable question from the Superintendent, when a consumptive scholar has been detected: "What am I to do? Where can I send him?" It is true that even if such an institution were available within reach, it would not always be possible to induce the child to go, but the parents of many would be grateful for the chance, and it would make all the difference if the possibility existed.

The Bombay Government "have offered to pay, to any municipality that may be ready to found special schools either for tuberculous children, or for children who are in danger of becoming tuberculous, three-quarters of the cost of the necessary buildings, and the same proportion of the cost of maintenance of the schools."* Hitherto, however, I have heard of no such school having been started. I have every reason to believe that if other Governments were to make a like generous offer,

* "Memorandum on some Recent Sanitary Developments in the Bombay Presidency," published by the Government of Bombay, February, 1914 (page 14).

and if it were open to private bodies as well as to municipalities, there would be those ready to respond and establish these urgently needed institutions. I should say without hesitation that in every province there ought to be at least one open-air "school-sanatorium" of this kind, and if the advantages were once realized by the leaders of the great communities, it would probably not be long before separate institutions were established—should this seem necessary—for Hindu and Mussalman children. In cities where the need is such as to justify the experiment, a day school on special open-air lines (combined as might be necessary with treatment in the way of additions to the ordinary diet, or the administration of simple medicines) would be a great boon.

In all such institutions, whether for boarders or day scholars, the question of education would take an altogether secondary place, every effort being made to improve the physique and development of the children so as to enable them to completely throw off all tendency to the disease. That this object is capable of frequent attainment in the case of the young has been abundantly proved, and the above proposals may be said to rest on established foundations of scientific fact, and to be of the greatest importance both from a curative and a preventive standpoint.

It is quite possible that such open-air schools might not be popular just at first. In this, as in many other similar cases, public opinion needs to be educated up to a due appreciation of what is needed. These institutions have however altogether proved their value in the United Kingdom, in Europe and in America, and indeed their essential importance as an element in any complete scheme of anti-tuberculosis measures is now widely recognised. As regards India, probably the best means of securing the public recognition of their value would be by the establishment of experimental institutions at suitable centres on a small scale.

(ii) Convalescent Homes and Sanatoria for Christian Children and Students.—As has been explained in the Chapter on Educational Institutions, the Christian community, in taking up a pioneer attitude in matters of education, especially as regards the establishment of

boarding schools, has had a heavy price to pay in the spread of tuberculosis in some of its educational institutions. It is unnecessary to say that this fact has been a matter of the most constant and earnest solicitude on the part of those who have been responsible for the health of the inmates of such institutions. Thought and money have been expended without stint in the effort to eradicate the disease; numbers of schools have been remodelled or rebuilt; but the fact that tuberculosis is so frequent in the homes from which the children come, makes the difficulty a well nigh insurmountable one. Those superintendents who are most careful to avoid the chance of exposing their children to infection, are the ones who feel most keenly the unhappy necessity of sending children with doubtful or actual signs of phthisis back to their homes, where they will, on the one hand, be under circumstances by no means favourable as regards prospects of cure, and on the other will be sources of danger to their families.

In the course of my tours, this need—of an institution to which children or students from Christian schools and colleges should be sent both for treatment and segregation—was one which was urged upon me most constantly and urgently, and with the greatest definiteness. The great success of the one experiment of the kind that has been made at the Tilaunia Sanatorium near Ajmere (see pp. 228-229), to which girls have been sent from schools all over Rajputana, the United Provinces and the Central Provinces, raises the proposal at once into the region of practical politics, and while even for girls this provision does not nearly cover the need, the fact that here and also at Almora some measure of provision has been made for female patients, serves to emphasize the great need for a "Home" on similar lines for boys and young men.

In the case of Christian children and students the doubt as to the recognition of the need of open-air institutional accommodation has been already set at rest by the experience of the above-mentioned sanatoria. Here, public opinion is represented mainly by Missionary opinion, and this has already been quite definitely formed and clearly expressed on the subject.

The expense need not be large; thus at Tilaunia the annual expenditure (excluding the Superintendent's allowance) of an institution with 74 inmates, only reached the astonishingly small total of Rs. 7,556, out of which Rs. 5,676, or more than two-thirds was borne by "fees," *i.e.*, board allowances contributed by the various schools or missions from which the patients had been sent. Such contributions in payment of board expenses would in almost all cases be readily forthcoming.

There ought to be no difficulty in the establishment of union sanatorium institutions to supply this need by a mutual arrangement between the numerous missions which would benefit by them. Financial assistance might naturally be looked for from Government as in the case of other aided institutions. The need is most urgent in North India, and the minimum of provision should be a sanatorium for boys and for girls, whether linked institutions or separate ones, for the eastern and for the western section of Northern India. For the former, including Bengal, Assam, Bihar and the eastern part of the United Provinces, a site somewhere in the Chota Nagpur highlands would be suitable; while for the Punjab and Rajputana, with Delhi and the western part of the United Provinces, a sanatorium might be located at some place in Rajputana (near Ajmere), or in some healthy sub-Himalayan district.

VIII. Tuberculosis "Settlements" or "Colonies."—Although in connection with the many-sided question of the prevention of tuberculosis, it has seemed necessary to select certain specialized institutions as giving on the whole, the best return for the money expended upon them, yet there are obvious difficulties and defects inseparable from such limited and partial efforts to deal with what is after all one great problem. Thus it is impossible in practice rigidly to limit a sanatorium to early cases, or the tuberculosis hospital to advanced ones, and the advantage is great of having the two institutions linked together, so that as may be necessary patients may be transferred from one to the other.

There are certain disadvantages which have been found to militate against the popularity of the ordinary sanatorium. It is difficult to induce patients to remain

under treatment long enough for them to secure permanent benefit, and this for various causes, amongst which may be mentioned the expense, the dulness and monotony of the life, and the separation from home and friends which is involved. The importance of regular occupation, especially employment of a useful and productive nature, has been keenly felt, yet it is difficult to arrange for this in the ordinary sanatorium.

For these and other reasons many prominent authorities in England and America have strongly advocated the establishment of comprehensive "Colonies" or "Settlements," adapted for the reception and appropriate treatment of the varied classes of individuals who are either suffering from or threatened with tuberculosis in any form.

Such a settlement would be constructed throughout on the open-air principles of sanatorium architecture, while the various buildings would be grouped with the generous allowance of site area introduced in connection with the "Garden-city" movement. It would provide not only for the institutional treatment of individual cases both of early and advanced stages of the disease, but for the residence under favourable conditions of whole families, including contacts and doubtful cases. It would have facilities for education under open-air conditions, and also for gardening, farming, or other forms of employment for those able to work, thus aiming at enabling patients to remain established with their families in the settlement after the close of the period of actual treatment.

Institutions of this nature have already been established on a comparatively small scale in England and America, and have given good promise of success. The British Ministry of Health has recently taken preliminary steps with a view to the establishment (at a total cost, it is said, of one million pounds sterling,) of ten such settlements in selected parts of the country.

There are certain conditions which would seem to mark out India as a country specially suited for an experiment of this kind:—

(1) The great and urgent need, as yet utterly unsupplied.

(2) The simple habits of the people, reducing to a minimum the difficulty in transporting families to a new abode. The comparative ease with which—now that the advantage has once been recognised—a whole village or a large section of a city population will evacuate their dwellings in case of plague, and live for long periods in temporary huts outside, is an illustration of this.

(3) The ease with which large sites could be obtained in suitable areas.

(4) The cheapness of building, and especially the fact that in many parts Indian climatic conditions favour an extremely inexpensive character of structure.

(5) The closeness of the family bond, and the custom of seclusion of women in India, greatly accentuate the need for providing for the family rather than the individual.

The great advantages which would be gained by an inclusive scheme of anti-tuberculosis activities, grouped together at one centre, and under unified expert control, are so obvious as scarcely to need repetition. Such a "garden-village" or colony would be an object-lesson in sanitary living for the whole country-side and its educational value would be very great. In combination with a tuberculosis depôt, or dispensary in the adjacent city, it would represent a real comprehensive effort to deal with the problem, and would be an ideal object for the generosity of any wealthy and practical philanthropist.

If the question be asked, however, whether the establishment of multiple colonies of this kind is a measure which can be wisely pressed for acceptance by Government or Municipal bodies, it is less easy to speak with confidence. Although the expense per head of such an institution, would not be heavy in comparison with that of hospitals in general, yet the total expenditure would be heavy indeed when the enormous number of individuals suffering from tuberculosis is considered.

It is estimated that in Bombay City alone there are approximately 10,000 cases of consumption, apart from

families and contacts who also would claim a share in a "settlement" scheme. Private enterprise may offer the very best to the fortunate few, but those responsible for public expenditure have to weigh the needs of all. On the whole then, attractive as the "Tuberculosis Colony" idea is, and while it is greatly to be hoped that funds may be forthcoming from some source, at least to establish an experimental colony at some suitable centre, it seems wiser, from the standpoint of prevention, to concentrate rather upon provision for advanced and infectious cases, and for the young.

CHAPTER XXIII.

CONCLUSION.

We have, in the foregoing pages, examined the evidence which indicates the wide-spread prevalence of tuberculosis in its various forms throughout the country; have discussed in detail some of the social and other factors which seem to be of outstanding importance with regard to its causation; have seen what has already been attempted by way of measures of prevention; and have tried to determine what efforts may be made in the future with the best hope of success.

The final question which remains for consideration is whether, in view of all the other problems which are to-day competing for public notice, this particular one of tuberculosis has any predominant claim upon the interest, the time, the money, or the personal service of those who desire India's highest prosperity.

There are certain important points for consideration in this connection, some of which have been already alluded to, but will nevertheless bear repetition here:—

First comes the fact of the exceptionally heavy toll taken by tuberculosis from amongst the adult and working members of the community. While it is estimated that out of the whole population tuberculosis may be the cause of approximately one death out of every seven or eight, yet when we limit ourselves to those of adult age, we find that the proportion rises, in cities at least, to about one in every three of the deaths recorded. Those whom the country loses from this cause are the students, the mothers, the breadwinners, the workers, those in short, whose lives are the most valuable, and whose sickness or death most seriously affects the welfare of others besides themselves.

Secondly, the insidious nature of the disease, its slow progress, and especially the infectious character which so often leads to successive members of a family being attacked one after another, very greatly increase its gravity from the social and economic view-point. Those

who have had personal experience of it amongst their own acquaintance will agree that a more serious misfortune can scarcely befall a family than for one of the members of it to be attacked with phthisis. The heavy and long-continued expense upon medical attendance, medicines, special nourishing diets, or change of climate; and the long-drawn-out anxious suspense, terminating so frequently in the gradual exhaustion and death of the patient, form a sequence with which we are most of us all too familiar. The fact that in so many cases it is preventible, adds greatly to our responsibilities regarding it.

Thirdly, we should remember the close relationship which has been shewn to exist between this particular disease and many of the most prominent problems and objects of social reform. Efforts made by the legislature, by municipal and other public bodies, by social service organizations or private philanthropists to lessen overcrowding, to improve the housing of the poor, or to ameliorate the conditions of labour, are all of them efforts to lessen tuberculosis, and knowledge regarding the disease will give both valuable indications as to method, and strong incentives to keenness in carrying out schemes for reform.

On the other hand there is very much on the prevention side of the tuberculosis problem which has nothing to do with slum improvements or slow-moving economic changes, and which depends for ultimate success upon the wide extension of knowledge, upon the spread of education, which is already advancing so rapidly, and which only needs stimulating and directing into special channels in order to effect great results in the actual lessening of consumption.

The problem before us therefore, is one of great gravity and urgency; it is all-embracing in its scope, and at the same time full of encouragement as regards the result of efforts made to deal with it. There are many, alas! to whose endeavours an added stimulus is given by the fact that the evil against which they fight is one which has already attacked their own homes. It is a special matter for congratulation and encouragement that there are those on all sides in India who are ready to take an active interest in movements for social

welfare such as have been alluded to. In almost every city there are to be found individuals or groups of men keenly interested in matters relating to social service, and only awaiting the requisite information for their activities to be directed into new fields.

As regards India's willingness to help in any organized efforts for the prevention of tuberculosis, abundant evidence was afforded in the course of my original tours of inquiry. Everywhere not only willingness to help was apparent, but anxiety to help quickly, and to be shewn what to do. There can be no doubt that the subject of tuberculosis is much in the minds of people at the present time. The disease is believed to be on the increase, its infectivity is becoming generally recognized, and its advent to a home greatly dreaded. By those possessing any acquaintance with the literature and social progress of the West, it is well known that very much is being done in the United Kingdom, Europe, and America, with a view to the prevention of consumption, and there is an impatient desire to see more active endeavours on the same lines in this country.

The readiness of the various indigenous societies, religious and social, throughout the country, to co-operate with efforts to combat tuberculosis has already been alluded to. The spirit of social reform, the desire for social service, is in the air now-a-days; students and leaders everywhere are anxious to serve their country and are finding that there is no higher way in which they can do so than in the earnest attempt to remedy its internal evils.

The success of the annual meetings of the Indian Social Congress, the alacrity with which members flock to join well-organized societies such as the Social Service League of Bombay or the more recently established similar League at Calcutta, the Sewa Sadan of Poona or the Sewa Samitis of Allahabad and other towns in the United Provinces, and the literature which is springing up on the subject, are all indications of the keen interest now being taken in movements for Social Reform.

Such movements are not merely for the increase of knowledge amongst the educated, they aim still more at

the diffusion of knowledge amongst the ignorant. The belief that responsibility for the results of ignorance, stupidity or carelessness may be all covered up by the use of the word "qismat," is gradually losing ground, and where ideas of personal responsibility begin to make way, those of social responsibility will quickly follow.

As regards Christian Missions, it is scarcely necessary to say that practically the whole of the missionary body would be ready to help with enthusiasm, in a cause which so closely effects the real well-being of the people of India. Do we wish to reach the women? It was a well-known Hindu leader who said to me: "Your Zenana Missionaries are the people to do this work; instead of teaching sewing and reading in the zenanas (as they have done in mine), let them tell our women how to keep healthy." The principals and staffs of colleges, normal schools for teachers, ordinary schools for boys as well as girls; missionary doctors, both men and women, all these would form a body of expert and enthusiastic helpers in any organized attempt such as has been suggested, in the direction of the diffusion of knowledge regarding health matters.

Is it too much to hope that in united efforts for objects which so obviously affect the true welfare of the country, a remedy may be found for some of the bitterness which in these days is so apparent in political life? The prosperity of a nation depends largely upon the physical condition of its population, and no one who claims to be foresighted can afford to neglect social science problems such as gather round the subject of tuberculosis. This is a fact which deserves careful consideration on the part of those who in these days are themselves hoping to assume a larger share in the Government of their country.

In connection with all the schemes for the prevention of tuberculosis, there is one word of warning which is of such importance that I have kept it until the very end. The experience of Western countries teaches us that as with all measures of reform, so here, ill-balanced or exaggerated action may result in evils

comparable to those which it seeks to remedy. An over-insistence upon the dangers of tuberculosis infection, especially in the case of people who are ignorant or impulsive, may result in grievous hardship to individuals, as has in fact happened in certain cases in England and America. The needs of the community imperatively demand the instructing of public opinion as to the means of checking consumption, but in doing so, the main emphasis should be laid on the facility with which safety may be secured, upon the positive value of fresh air, light and cleanliness, rather than upon the dangers resulting from the presence of consumptives within the community. This consideration affords, in my opinion, a further strong reason why, in any wide educational movement for India, it will be better to have a more inclusive health programme, as above suggested, rather than to concentrate upon a narrow anti-tuberculosis propaganda.

More important than the establishment of sanatorium institutions is the improvement of domestic hygiene, and here again the one great need is knowledge. The true remedies are everywhere at hand in free and inexhaustible quantities—light and air. General diffusion of knowledge as to their priceless value will do more than the establishment of a hundred institutions. An incident of which I recently heard is typical of the India that is passing away. A Civil Surgeon was summoned from a long distance to attend a wealthy merchant dying of pneumonia. All that money could purchase was there, cylinders of oxygen obtained at great expense from Calcutta, two hundred miles away, only awaited the arrival of someone who could explain its use; *but every door and window in the sick man's room was tightly shut!* There is no lack of loving care for the sick, the rows of empty bottles of "Scott's Emulsion," or Grimault's Extract ("Lal Sharbat,") constantly seen in the room of a consumptive is eloquent of this. It is knowledge that is lacking, and the diffusion of that knowledge will not be long delayed.

A Western observer may note what seem to be factors in the causation of disease, and may venture to

make suggestions in accordance with his observations. It is only, however, in proportion as such suggestions are appreciated by the people themselves, and acted upon by them, that any real benefit can ensue. It is for India to shake herself free from tuberculosis, and in the process of doing so, there are other diseases also of which she may hope to rid herself.

APPENDIX A.

NOTE ON CONSTRUCTION OF HUTS.

Referred to on Page 132.

(i) Site.

If the site is low-lying it must be raised with sweet earth to 9 inches above the surrounding ground.

(ii) Walls and Roof.

Wattle and daub make a wall which is unobjectionable from a sanitary point of view, provided that the surface is finished smooth and true to prevent accumulation of dust and vermin.

A mud wall should be forbidden unless the lower portion, up to a height of at least 2 feet from the plinth, consists of burnt brick. If the lower portion is made of mud or sun-dried brick, rats may burrow in the wall and live in it. The mud should be flush with the surface of the bricks, so that rats may not be able to burrow above the 2 feet of brick.

Hollow walls, and walls of rubble and mud mortar, should be forbidden as they harbour rats.

The use of old kerosene oil tins should not be allowed. The tins easily rust and get displaced, and holes are liable to be filled up with dirty rags. Huts of this material cannot be made to look tidy.

The kinds of wall which are unobjectionable from a sanitary point of view are :—

(*a*) wattle and daub as above described ;
(*b*) mud with 2 feet of burnt brick below ;
(*c*) a wall having a thickness of not more than 6 inches and composed of sun-dried bricks built in mud as a filling for a frame-building after the Assam pattern;
(*d*) stone or brick with lime mortar :
(*e*) corrugated iron, which should be painted or lime-washed in order to preserve the sheets and to reduce the temperature ;
(*f*) wood.

The use of palm-leaves and bamboo matting for a wall is not recommended, as these are liable to catch fire and are not altogether unobjectionable from a sanitary point of view.

The same objections apply to a roof made entirely of these materials, which provide a home for rats and other vermin and for snakes.

The objections to a roof of country tiles are that they are heavy, they harbour rats and other vermin, they leak badly, and they require turning every year. Age makes them of

dark colour, when they absorb heat which they continue to radiate long after sunset.

The use of either Mangalore tiles or corrugated iron should be recommended. Though corrugated iron is hot and unsightly, these disadvantages can be removed by using a covering of grass or palm-leaves or bamboo matting or thatch. or, in the case of corrugated iron, by a coat of paint composed of a mixture of lime or whitening and vegetable oil. One cwt. of corrugated iron sheets will suffice to roof 66 square feet.

An excellent lime-wash which will adhere to the corrugated iron can be made by mixing 10 per cent. of any common vegetable oil (except castor oil) with the lime during slaking, the lime to be weighed dry. If the oil does not saponify and incorporate with the lime, the mixture must be boiled a little until the oil disappears. The oil forms with the lime an insoluble soap, which when once dry will not readily wash off with heavy rain.

(iii) Foundations.

Posts should rest on a flat stone 2 feet below the surface, the ends of the posts being charred and tarred underground, and to a height of 6 inches above the surface. Good earth should be rammed round the posts.

(iv) Plinth.

The plinth must be high enough to prevent flood water from entering the hut, and, if not built of stone or brick, must be protected against the danger of undermining by flood water.

A bottoming for the floor may be formed of broken stone, broken brick, gravel, or hard furnace ashes, in a layer 4 inches deep which should be blinded with *Kankar* or sand and well rammed. If water is used in the ramming the surface should be allowed to dry at least two days before covering.

For a covering, Shahabad or Tandur stone may not be very costly in some districts and may be used with advantage. The cost of such stone in Bombay (supply only) is Rs. 8 per 100 square feet.

A less expensive covering consists of a mixture of tar with stone chippings, gravel, sand, or any gritty material. A layer about one inch thick should cover the bottoming and should be well rammed, the surface being sealed with sand or stone dust. The amount of tar required per 100 square feet of floor would be between 2½ and 3 gallons. One cwt. (10 gallons) of distilled tar costs Rs. 3-8-0 in Bombay, and might cost Rs. 5 if purchased in small quantities.

The advantages of such a tar covering are that it is a bad conductor, is unfavourable to insects, and can be readily washed. The covering must extend to the whole of the plinth area and then acts as a damp-proof course. Rats which might burrow in the plinth would not penetrate the tar.

The use of cowdung for making floors is hygienically objectionable, owing to the danger of ingestion or inhalation of infective fœcal matter.

(v) Floor Space.

100 square feet should be the minimum for a room and there should be no partitions within such area. In such a room there should not be more than four persons living.

It is very desirable that there should be a cook-room in addition to this accommodation. The cook-room can be conveniently situated on the *otla* by extending the room and enclosing two sides, and should have a floor of stone, not tar. A ventilator should be placed in the roof of the cook-room.

In the absence of a cook-room a raised *chula* should be provided.

In order to prevent the floor from getting broken up, all operations in connection with cutting of wood and husking of grain should be carried out on the verandah and a stone 15 by 15 by 6 inches should be provided for the purpose.

(vi) Ventilation.

In addition to the door, there should be two openings to the external air. These should be of approximately equal size and must be in opposite walls. The total area of these two openings should not be less than 1/16 of the floor area. The openings may be protected with expanded metal, wire netting or iron bars, but no rags or cloth should be allowed. Weather screens may be provided.

No part of the roof should be less than 7 feet above the floor of a room.

(vii) Internal Arrangements.

Shelves and pegs and lines for hanging up clothes, etc., must not interfere with access of light and air through the two prescribed openings.

Lofts should not exceed 1/6 of the floor area of a room, should be at a height of 7 feet above the floor, and should be fixed along a wall where no window or ventilator will be interfered with. The width of a loft should not exceed 2 feet 6 inches.

(viii) External Open Space.

No structure, whether containing one or more huts, should be allowed on any plot unless the plot is such as to contain an open space equal to at least twice the area covered by the structure and any other erections of every kind (excluding eaves) on the plot.

No part of the structure including eaves should be within 4½ feet of the boundary of the plot or within 9 feet of any hut not forming part of the structure.

Every tenement should have access to a public road or passage at least 10 feet wide.

(ix) Surroundings.

The bathing arrangements, water-supply and sanitary conveniences in connection with a hut must be in accordance with the local authority's by-laws.

Trees and plants surrounding a hut should be encouraged, both as affording shade and as improving the appearance of the dwelling.

The ground immediately adjoining a hut for 4½ feet all round should be properly consolidated and dressed. Murum will do for the purpose or broken brick.

Cattle should not be kept within 10 feet of a dwelling-house.

It is highly desirable that every hut should have sufficient open space to make the growing of a few plants and vegetables possible. Where a group of huts is to be constructed on a considerable area of ground, it might be found possible to arrange for a protected well and for a plot which could be allotted in strips to the respective owners of huts for growing vegetables. In planning a group of huts, it should not be considered essential to arrange them in monotonous straight lines; large trees, or variations in levels of the ground, can be made a basis for picturesque grouping.

(x) Maintenance.

It is obviously desirable that huts built according to the standard prescribed above should be the subject of constant municipal inspection, so as to ensure that the standard is maintained. It is suggested that, in order to encourage cleanliness and tidiness, rewards might be given to those who keep their huts and surroundings in the best condition. Whitewashing of walls should be encouraged.

INDEX.

(ABBREVIATION : T. = Tuberculosis.)

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